The AUTOMOBILE

JUNE 26, 1913 10 CENTS A COPY

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WARD LEONARD

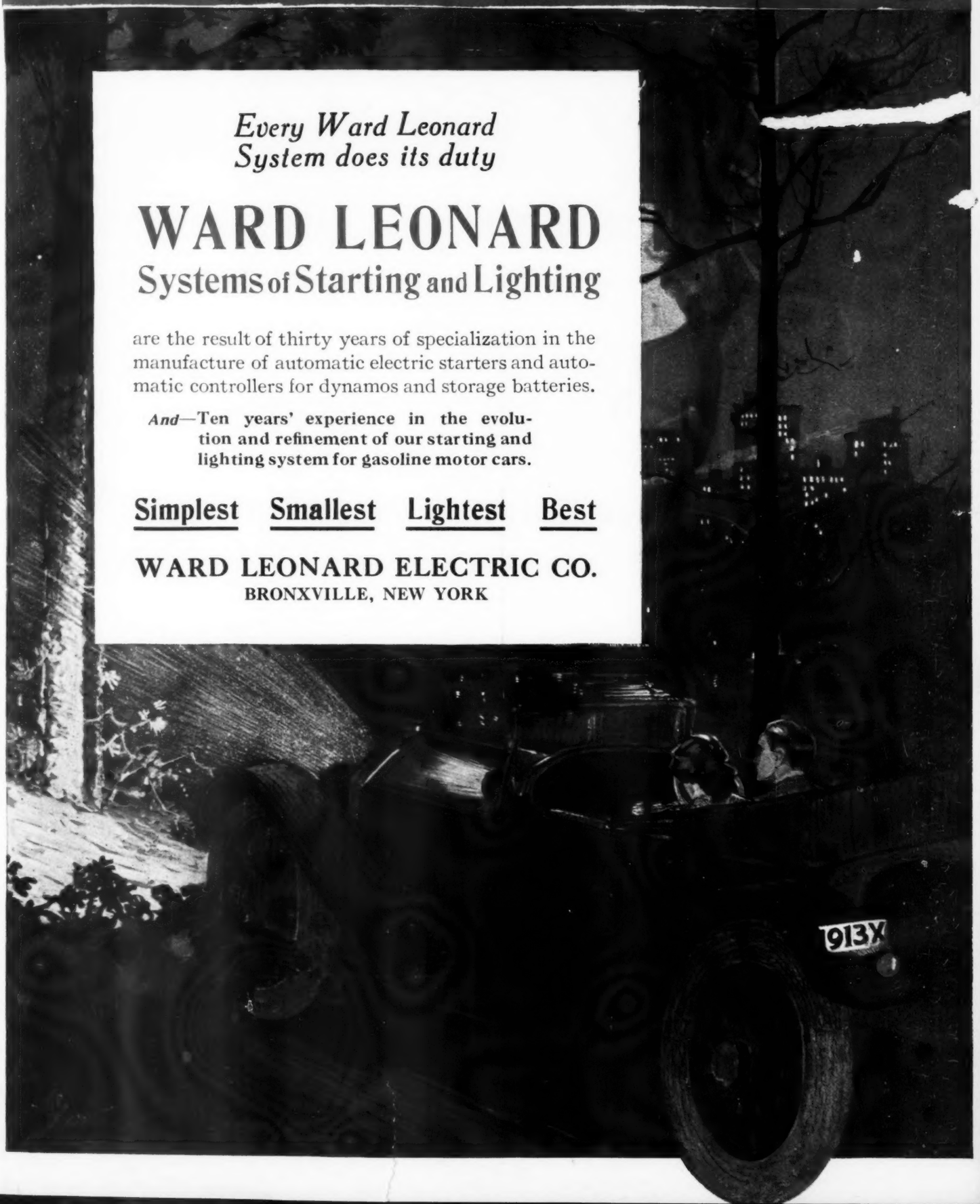
Systems of Starting and Lighting

are the result of thirty years of specialization in the manufacture of automatic electric starters and automatic controllers for dynamos and storage batteries.

And—**Ten years' experience in the evolution and refinement of our starting and lighting system for gasoline motor cars.**

Simplest Smallest Lightest Best

WARD LEONARD ELECTRIC CO.
BRONXVILLE, NEW YORK



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Pat. Sept. 15-22, 1908.

REPUBLIC
STAGGARD TREAD
TIRES

Clever phrases, coined features can't give you more mileage. Quality, unlike beauty, is more than skin deep. It's the stuff in the tire—and the way it's put in that counts.

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Call on any Republic Dealer and ask him to show you a cross-section of the Republic Staggard Tread Tire. Let him explain how it is made.

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Branches and Agencies in the Principal Cities

VOL. XXVIII NEW YORK—THURSDAY, JUNE 26, 1913—CHICAGO No. 26

The AUTOMOBILE

Akron

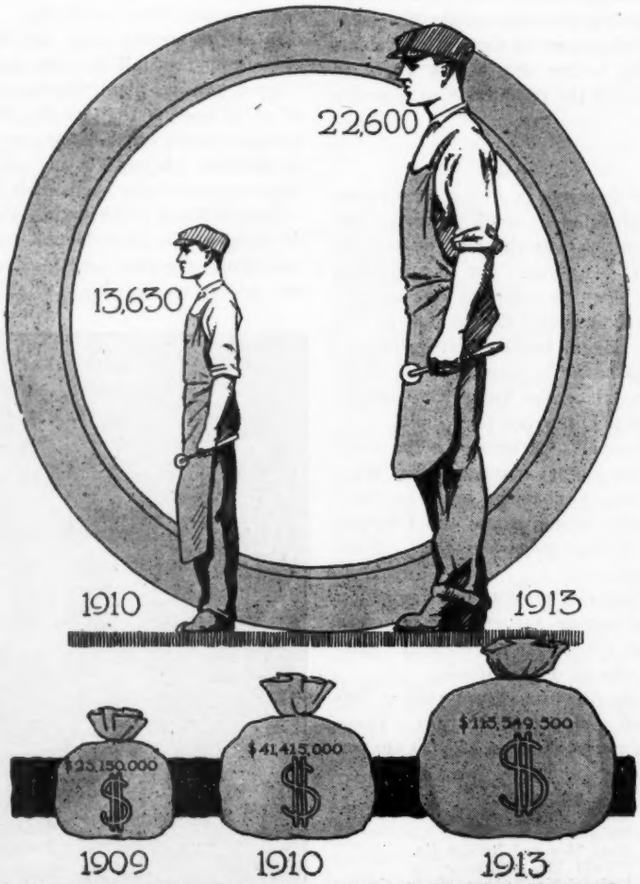
Where 20,000 Tires Are Made Daily

By L. V. Spencer

AKRON, the foremost city of the world in the production of rubber goods, gives to the automobile public 20,000 tires each day. It turns out in every 24 hours more pneumatic and solid motor vehicle tires than all the rest of the United States combined.

Considering that the average diameter of these tires is 34 inches, that is, taking into account all the different sizes, if a day's output of the Akron factories were arranged in a long line so that each tire would be tangent to both the one in front of it and the one behind—and here the statistician gets in his work—the line would measure nearly 12 miles in length. Or, going a step farther, and figuring on this production for a year of 300 working days, the line would have a length of 3,400 miles, or more than the distance across the American continent by about 1,000 miles.

It is hard to realize that there is is a demand for such an enormous quantity of tires as that produced in Akron alone, not to mention the outputs of many other very large tire manufactories throughout the United States. Yet several of the Akron factories are laying plans for further additions to the tire-making divisions of their plants so as to materially increase their outputs. It is rather difficult to see where such enormous production will end.



Upper diagram shows enormous increase in Akron's rubber workers in 3 years. Below, total capitalization of rubber factories in Akron for 1909, 1910 and 1913. Note great increase made last year

For the making of this great line of tires, besides the daily production of an enormous quantity of mechanical rubber goods, hard rubber specialties and every other conceivable class of merchandise made of rubber, one-third of the world's total production of crude rubber finds its way to Akron, giving this thriving city of Northern Ohio a unique position in the industrial world.

Just as Detroit is looked upon as the Mecca of the makers of automobiles and their parts, as Minneapolis is noted for its flour mills, as Sheffield is linked with steel, so Akron is known the world over as the rubber goods city. Many a rubber man in far-away Ceylon or in South America knows little or nothing of the cities of the United States, but, nevertheless, the name of Akron is at his tongue's end. To him it is well nigh synonymous with his trade with the Great United States.

The wage check handed over by Akron to its large army of rubber workers amounted to more than 12 million dollars for the year 1912

While the rubber industry has been the chief business of Akron for a number of years, it is only within the past 10 years that it has had any remarkable growth. Although the making of tires is only one branch of the rubber-making industry of Akron, it is clear that the rapid strides which the factories have made and the proportionate increase of every branch of its commerce which is related to rubber making are due largely to the unprecedented growth of the automobile industry with its consequent demand for an enormous number of pneumatic and solid tires.

Akron must charge its steady growth and present prosperity to the automobile industry, just as Detroit has done. Ten years ago the B. F. Goodrich Co. and the Diamond Rubber Co., now combined, were the only companies turning out automobile tires in Akron. Their output was only a few hundred a day at that time. The other large rubber concerns which now have a large daily production were then not doing any automobile tire business at all. But the greatest development in the motor vehicle tire business in Akron has been within the last 5 years in parallel with the giant strides made in the production of automobiles during the last few years.

Industry Began in 1869

Forty-four years ago the rubber industry in Akron was begun. In 1869 Dr. B. F. Goodrich established a small plant for the manufacture of rubber products which was the nucleus for the present great combine which bears his name. The first building measured 40 by 100 feet, and the doctor's company was capitalized at $100,000. Little did the genial doctor dream that in less than 50 years his company would have a factory giving employment to nearly 15,000 workers and having a floor-space of about 65 acres. The present capitalization of the Goodrich combine is $90,000,000, and it manufactures about 10,000 tires daily.

Dr. Goodrich's first plant employed 25 persons. In the early days he is said to have been his own factory manager, chief engineer, chemist and traveling salesman. For several years he alternately journeyed around the country taking orders and returned to his little factory to personally see that they were filled. None of the original buildings now remains.

Since then other great rubber factories have sprung up within the city, gradually and surely advancing the small community which in Dr. Goodrich's time had a population of about 10,000 to the present thriving industrial city of 90,000 people.

There are at the present time in Akron eighteen rubber factories as against fourteen in 1909 and fifteen in 1910. These eighteen plants, having an aggregate capitalization of $113,549,500, are listed:

American Hard Rubber Co.
American Tire and Rubber Co.
Buckeye Rubber Co.
Federal Waterproofing Co.
Firestone Tire and Rubber Co.
B. F. Goodrich Co.
Goodyear Tire and Rubber Co.
Gregory Rubber Co.
Hadfield Rubber Co.
Lion Rubber Co.
Miller Rubber Co.
Mohawk Rubber Co.
Motz Tire and Rubber Co.
O'Neill Tire Protector Co.
Philadelphia Rubber Works Co.
Portage Rubber Co.
Starr Rubber Co.
Swinehart Tire and Rubber Co.

There are few who have not actually visited these great rubber goods making institutions who realize the enormous scale upon which they are built. The Goodyear factory, for instance, offers employment to about 6,000 men, has a daily capacity of 6,000 automobile tires in addition to its many other lines of manufacture and has 2,000,000 square feet of floor-space. Some statistician has figured out that if the Goodyear factory were 50 feet wide and one story in height, it would be over 8 miles long.

The Firestone company is housed in the largest single rubber manufacturing building in the world. This plant covers 15 acres and gives employment to 3,500 persons. It produces 50 tons of finished tires each day.

Then there is the Swinehart plant, which is turning out in the neighborhood of 10 tons of solid tires and from 300 to 500 pneumatics daily. In this plant there are 300 employees. An addition is now under way which will double the Swinehart plant in size and make it possible to increase the production of tires about three-fold.

The Miller Rubber Co. furnishes employment to 1,200, and has a pneumatic tire output of 1,000 a day. Seven hundred of its employees are connected with the production of tires, while the others are concerned with the making of rubber automobile accessories and various other rubber products. No solid tires are made by this concern. The floor-space of the Miller plant is 200,000 square feet.

In the Buckeye plant of the Kelly-Springfield Tire Co. we find about 550 men engaged in the making of 500 tires and a like number of inner tubes each day. Several new buildings are under way at the present time, and the company plans to increase its tire output this fall to 1,200 daily.

An extensive plant dealing exclusively with the manufacture of solid tires is that of the Motz Tire and Rubber Co. This company turns out a large number of special solid cushion tires particularly adapted for use on electric vehicles. Recently some improvements have been made in these tires.

The Mohawk Rubber Co., which about 90 days ago took over the plant of the Stein Double Cushion Tire Co. and remodeled it, is making passenger car tires exclusively. It turns out 150 casings and 500 tubes per day with 75 employees. The plant extends

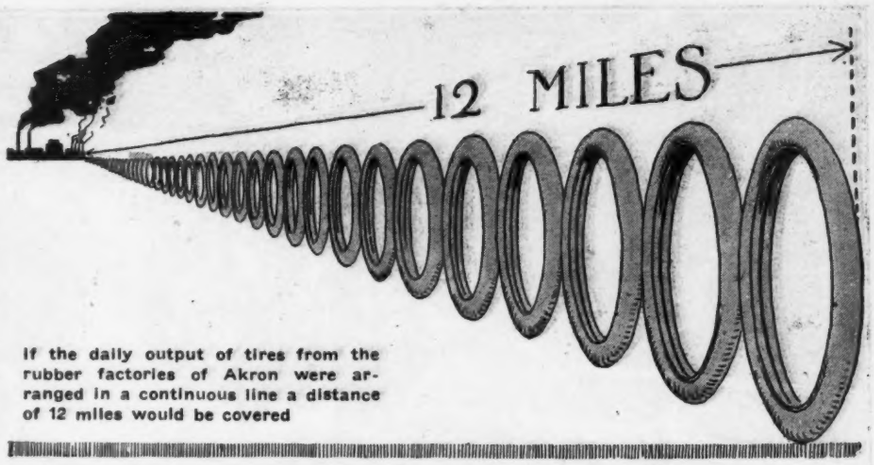
View in the tread-laying room of a tire factory

over an area of 100,000 square feet.

Another tire maker is the Portage Rubber Co., which turns out 150 pneumatics and 200 tubes each 24 hours. Its workmen number 200, half of whom are in the tire branch, the rest being concerned in the making of mechanical rubber goods.

The American Tire & Rubber Co., with 50 men and a floor-space of 30,000 square feet, manufactures inner tubes, tire accessories and cements, besides a line of mechanical rubber goods.

Then there is the O'Neill Tire and Protector Co., which makes tire protectors, reliners, blow-out patches, air bags, portable vulcanizers and the like. It has a plant of 11,000 square feet and gives employment to twenty-four persons.



If the daily output of tires from the rubber factories of Akron were arranged in a continuous line a distance of 12 miles would be covered

The Philadelphia Rubber Works Co. is not in the tire making line, but confines its activities to the manufacture of reclaimed rubber only. Its process for the reclaiming of rubber is exceedingly extensive, and to the plant comes all sorts of rubber scrap. A large proportion of this is worn out tires, the rubber in which, though no longer of value for automobile purposes, nevertheless may be reclaimed for many other uses.

The American Hard Rubber Co., as its name implies, does not make any soft rubber goods whatever, but concentrates on the making of specialties of the hard rubber variety such as battery jars and the like.

Automobile goods are also out of the line of the Federal Waterproofing Co., which specializes on waterproof materials.

The Star Rubber Co. 2 years ago discontinued the making of automobile tires, its factory now being devoted to the production of seamless rubber articles.

The Hadfield Rubber Co. has some products for the automobile trade. These are rubber bumpers, insulators and washers. In addition, it gets out a number of specialties for surgeons' and household use. It employs about a dozen men.

A unique line is that of the Gregory Rubber Co., which is not engaged in the making of any motor car products, but makes rubber specialties and toy balloons, the latter being the larger end of its business by far. For this special line, twenty people are employed and 8,000 square feet of floor space occupied.

The Lyon Rubber Co. is also a specialty concern, making tire repair cements, repair patches and accessories.

In the sundries room, showing arrangement of tire formers

These interesting facts and figures covering Akron's plants will serve to bring home more forcibly to the average reader the extent to which this single industry in a single city has developed.

Last year Akron's eighteen rubber factories had an output valued at $94,445,000, which includes all classes of rubber goods. There are in the city 144 manufacturing concerns inclusive of the rubber factories. These have a total capitalization of $142,356,450 at the present time. Thus it will be seen that these eighteen factories, though being only 11.8 per cent. of the total number of establishments in the city, represent 79.7 per cent. of Akron's total invested capital.

Capitalization Increases Fivefold

This enormous capitalization of the rubber factories, headed by the $90,000,000 Goodrich company, has increased nearly fivefold in the last 4 years, as shown by the following table:

TOTAL CAPITALIZATION AKRON RUBBER FACTORIES

Year	Amount
1909	$25,150,000
1910	41,415,000
1913	113,549,500

An interesting feature of a consideration of any industrial community such as Akron is the number of wage earners and how that large army is provided for in the way of living facilities—always a serious problem. Over one-third of the city's present population is of the wage earning class. Or, to be specific, there are employed in the 144 establishments claiming Akron as their home 34,700 working men and women. Sixty-five per cent. of this number, or 22,600, find employment in the rubber factories, making this single industry responsible for one-quarter of the city's population.

Six Payrolls Average $12,022,780

During 1912, the six largest rubber companies had an average payroll of $12,022,780, a figure close to the aggregate bank deposits in all of the banks of the city on an average day last year. While the rubber workers are by no means all concerned in the making of tires, it is safe to say that about one-quarter of the rubber workers are employed in some operation or other connected with the making of these necessities of automobiling. It is impossible to obtain any figures which segregate the number of tire workers from the total employees in the plants, no statistics being kept along this line, owing to the continually varying conditions.

For similar reasons we are unable to go back more than 3 years for accurate statistics as to the total number of workers. However, in the past 3 years, since the automobile industry began to make such rapid strides and to demand millions of tires each year from the Akron factories, the percentage of increase of rubber workers has been 5.35 per cent. as compared with the total population of the city. The following table, which shows the

The calender room where the rubber stock is passed through the heated rolls of the huge calenders

exact figures for 1910 and 1913 brings out this point strongly:

Year	Total population	Wage earners in rubber factories	Percentage of total population in rubber industry
1910	69,067	13,630	19.75
1913	90,000	22,600	25.10

Thus it is shown that the rubber industry has probably drawn heavily upon other lines of industry in the city within the last few years, and that while these other lines have also grown to help swell the total population, the city's chief industry today gives employment to one-fourth of the people when 3 years ago it paid one-fifth for its services, although in the same period the total number of persons in the city has increased by 30 per cent.

The nature of the rubber manufacturing business and particularly most of the operations in connection with the making of tires requires the services of employees of the skilled class, though it is true that unskilled labor may be utilized for many operations. Piece work schemes seem to predominate in the Akron factories, and on this basis many of the men make good wages of from $4 to $6 each day.

There is practically no other city in the country the size of Akron where the working class has so much money per capita. A general air of prosperity pervades the community.

Erect Houses for Workers

The employers and the civic bodies of the city have not lost sight of the fact that adequate living facilities must be provided for its large industrial army. Additional workingmen's homes are being erected as fast as possible, largely through the endeavors of the Housing Committee of Akron's wide-awake Chamber of Commerce, which has a membership of about 1,200 of the city's leading business men.

There is still a great demand for small houses in the city and the Chamber of Commerce is seeking to interest outside capital along this line by various kinds of publicity. For the fiscal year ending November 1, 1912, the records of the City Building Inspector's office show that 2,372 permits were issued for the erection of houses. This is a rather remarkable showing for a city of this size, but it is believed that a still larger scale of building operations will be recorded this year, due to the rapid growth.

The factories themselves are aiding in the work of providing homes for their men. As a case in point, the Goodyear company has recently purchased a tract of land adjoining its plant where desirable homes are to be built for its employees, the properties being sold to the men on very easy long terms at cost. By this arrangement a man can own his home in from 12 to 15 years.

Besides this, this concern operates a hotel, so called, where newcomers to the city who are employed at the factory may live until they can find a permanent location. They are charged for this only a nominal sum of 15 cents a day for the first week, 20 cents for the second, and so on. This scheme is working very successfully.

These views may seem diametrically opposite to the published reports which were current at the time of the recent strike trouble in the city. That strike probably did more to rid the city of an undesirable element and to clear up misunderstandings between employers and employees than anything else could have done. Today they are closer together than ever before.

Like many another affair of its kind this strike grew from a

Each tire is buffed before the tread is put on

Scene in the curing room where pneumatic tires are given their first vulcanization

small affair until it had spread through the whole body of rubber workers of the city. Certain strike agitators then descended upon the community and made many claims against the Akron employers which were not only unfounded but malicious. It was at the instance of these agitators that the Senate of the State of Ohio sent a committee to Akron for the purpose of actually probing the labor conditions there and to determine just how many of these claims, if any, were true.

In addition to discovering that the strike instigators were advocating a system of sabotage, the committee discovered that their claims were in the main absolutely ungrounded. In its report, the committee further brought out that the testimony of the employers and employees showed that the wages paid by the rubber companies generally compare favorably with those paid in other industries and that the wages paid in the tire-building and tire-finishing departments are evidently higher than those paid in other industries where like skill and effort are required.

After cleaning, the tread is applied as shown

The Ohio Senate Committee's findings went further in stating that the buildings of the rubber companies are practically fireproof, well-lighted and so constructed as to provide good ventilation. And in conclusion it was shown that the investigation has proven profitable and of great value to the rubber manufacturers, the employees and the general public. "The testimony has developed abuses which had crept in and grievances of which the managements of the rubber factories were not aware. Many of those have no doubt already been corrected, all of which is to the advantage of all concerned."

All of this may present the unpleasant circumstance in a different light to many as coming from an unbiased source. Many of the workers did not know what they were striking for. The cloud has completely blown over now; the factories are running with the normal number of operators; production has been put back to its normal. Akron is itself again and the better for its experience.

Banking Institutions Are Active

Always a criterion by which to judge the prosperity of any community is the activity of its banking institutions. The Akron Chamber of Commerce statistics show that, besides an increase of 89 per cent. in invested capital and 31.4 per cent. in the number of those employed for 1912 over the previous year, the Akron banks also had a prosperous year. The total deposits in all of the banks of the city on November 1, 1912, aggregated $16,648,441, as against $14,717,790 on the same date in 1911, an increase of 13 per cent. The surplus and undivided profits of these institutions also showed an increase of 8 per cent. for this period.

Akron's bank clearings of $93,378,000 for the year 1912 were 43.0 per cent. greater than they were for the previous year. This gain was greater than that of any other city of the Central States, according to the statement of R. G. Dun & Co. This is but another proof of the increasing volume of business which the city enjoys.

Akron, with its advantageous location for trade, its shipping facilities afforded by five railroads, its educational features and its offering of cheap and desirable living conditions for its workmen, has risen to its present proportions logically. The automobile industry is responsible for its rapid growth within the last few years, and just as long as that industry continues to grow, so will Akron advance correspondingly. There is no limit to its possibilities as a commercial center.

Alter Tariff Rate Bill

New Rate on Cars Submitted to Senate Caucus Calls for Duties of 30 To 45 Per Cent.

WASHINGTON, D. C., June 22—The Underwood-Simmons tariff revision bill, as agreed upon by the Democrats of the Senate finance committee, has been submitted to the Democratic caucus of the Senate and yesterday went through a full day's session of the caucus with harmonious support for most of the alterations the Senate finance committee members had made in the original bill. The new rate on motor cars as submitted to the caucus reads as follows:

"Paragraph 121. Finished automobiles, valued at $1,500 or over and automobile bodies, 45 per centum ad valorem; finished automobiles valued at less than $1,500, 30 per centum ad valorem; automobile chassis, and finished parts of automobiles, not including tires, 30 per centum."

Cheap motor cars, as necessaries of business and farming life, were the subject of much of yesterday afternoon's debate in the caucus. The finance committee democrats cut the Underwood rates from 45 per centum to 30 per cent. on motor cars valued at less than $1,500, and in the debate several democratic senators urged a further cut and recommended that the tariff be only 10 or 15 per cent on cars valued at less than $1,000. This demand was made on the ground that cheap motor cars were now commercial necessities.

The caucus did not settle the motor car controversy, but asked Chairman Simmons and his colleagues on the finance committee to investigate further. Advocates of the lower duty claim the government would lose little revenue, as the high-priced machines pay most of the tariff.

J. D. Maxwell To Build Cars

INDIANAPOLIS, IND., June 25—*Special Telegram*—J. D. Maxwell and associates have bought the plant of the T. B. Laycock Mfg. Co. here, for approximately $300,000 and will manufacture automobiles. Manufacturing and selling companies are being formed and forces organized. Details are not available now but a medium-priced car will be built. The plant is 880 feet long and 270 wide and has its own heating, lighting and water plant.

Stepney Motion Denied by Court

NEW YORK CITY, June 20—Motion made by the Stepney Tire & Rubber Co. to combine its countersuit with the suit of the Rutherford Rubber Co. was denied yesterday in Supreme Court, Special Term. The Stepney Tire & Rubber Co. has filed a countersuit of $72,000 against the Rutherford company, alleging breach of contract in supplying poor material. The Rutherford company manufactured tires for the Stepney company to be sold as an unguaranteed product. The latter company states that tires were returned that had not covered 5 miles although the contract stated that the tires were to have the same tread as the regular Rutherford output.

The suit of the Rutherford company is for a little more than $2,000 and is for moulds which they claim the defendants should continue to pay for under the contract. The Stepney company has not been actively in business for the past 2 years, according to Walter Lissberger, former treasurer.

Midland Assets Are Indefinite

MOLINE, ILL., June 21.—An examination of the books of the bankrupt Midland Automobile Co. has been held and shows that the assets of the company could be placed anywhere from $100,000 to $190,000 while the liabilities are approximately $250,000. The cause for the indefiniteness in assets is that most of the equipment is old. Originally it cost slightly over $200,000. An invoice is being made and basis on which settlement will be made with creditors will be announced soon. Edward McCullough of Springfield has been appointed receiver of the defunct company by Judge Humphrey of the federal court at Springfield. Attorney G. A. Shallberg of Moline is representing the creditors of the tri-cities.

Milwaukee Motor Co. Files Petition

MILWAUKEE, WIS., June 23—An involuntary petition in bankruptcy has been filed against the Milwaukee Motor Co., Milwaukee, Wis., by three creditors with claims aggregating about $350,000. They are: Racine Brass & Iron Co. and Standard Foundry Co., Racine, Wis., and the Standard Paper Co., Milwaukee. The petition states that the company has assets of about $350,000 and that its liabilities are about $280,000.

It is alleged that the Milwaukee Motor Co. performed an act of bankruptcy on May 19 in transferring to Ernst G. Miller, of Milwaukee, $25,000 in notes given to the company by the Imperial Motor Car Co., Jackson, Mich., which constituted a preferential payment. The First Savings & Trust Co., Milwaukee, has been appointed trustee under bonds of $10,000.

The past success of the concern, the large number of orders on its books for execution, and the energy behind the company will, it is confidently believed, result in a speedy settlement of the bankruptcy litigation. The plant is being operated at full time and the trustee will continue it in this manner.

Ford Declares $10,000,000 Dividend

DETROIT, MICH., June 24—That a cash dividend of $10,000,000 has been declared by the Ford Motor Car Co. is the report in banking circles of Detroit. It is stated that Mr. Ford, owning 51 per cent. of the stock, will get $5,800,000. James Cousins gets $1,150,000 and Dodge Brothers and the Gray estate get $1,000,000 apiece. Checks for $500,000 go to John W. Anderson and H. H. Rackham. This report comes through Detroit bankers and has not as yet been verified by any offices of the Ford company although the report is accepted here as correct.

Want Board Declared Bankrupt

WASHINGTON, D. C., June 23—A petition that the B. F. Board Truck Co., Alexandria, Va., be declared a bankrupt has been filed by a number of creditors. The petition has been made returnable July 3. The affairs of the company are now in the hands of T. C. Smith as receiver.

BUFFALO, N. Y., June 24—*Special Telegram*—Nathan W. Williams, of Evanston, Ill., began suit today in the United States District Court against the Motor and Manufacturing Co., of Dunkirk, N. Y., alleging infringement of patents. The plaintiff declares that he holds patents for a heating and ventilating system for automobiles and claims they have been infringed.

COLUMBUS, O., June 23.—The new managers of the Columbus Buggy Co., T. C. Dunlap and George W. Lattimer, have started to operate the plant on an aggressive scale. About 150 men are employed at the plant completing the jobs already started under the receiver. Steps are being taken to organize a new company to take over the assets.

Automobile Securities Quotations

Recovery of the rubber stocks is the predominant feature of the market for the past week. Firestone common, which had dropped 32 points during the past 2 weeks, regained 7 and Goodyear picked up 11. Alco preferred took a jump of 10 points while Pope preferred fell off 7 points. Outside of these facts the summer quietude of the market was undisturbed.

	1912		1913	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	110	115	155	165
Ajax-Grieb Rubber Co., pfd	90	100	93	100
Aluminum Castings, pfd	100	..	97	100
American Locomotive Co., com	42	42½	29	30
American Locomotive Co., pfd	108⅛	110	100	102
Chalmers Motor Company, com	..	..	127	137
Chalmers Motor Company, pfd	..	..	97	102
Consolidated Rubber Tire Co., com	15	18	14	18
Consolidated Rubber Tire Co., pfd	55	59	60	75
Firestone Tire & Rubber Co., com	279	281	235	245
Firestone Tire & Rubber Co., pfd	106	108	104	106
Fisk Rubber Company, com	..	..	..	..
Fisk Rubber Company, pfd	..	..	..	100
Garford Company, preferred	90	100	85	95
General Motors Company, com	31	34	26½	28
General Motors Company, pfd	74	75	72¾	75
B. F. Goodrich Company, com	79½	80½	26½	27½
B. F. Goodrich Company, pfd	107¾	108¼	90	92
Goodyear Tire & Rubber Co., com	265	275	294	300
Goodyear Tire & Rubber Co., pfd	100	102	96	*98
Hayes Manufacturing Company	..	104	..	90
International Motor Co., com	23½	25	3	6
International Motor Co., pfd	86½	88	18	25
Lozier Motor Company, com	..	..	15	25
Lozier Motor Company, pfd	..	..	..	92
Maxwell Motor Co., com	..	..	3	5
Maxwell Motor Co., 1st pfd	..	..	27	31
Maxwell Motor Co., 2nd pfd	..	..	8	11
Miller Rubber Company	160	165	..	140
Packard Motor Company	104	106	95	101
Peerless Motor Company, com	..	..	45	50
Peerless Motor Company, pfd	..	..	..	96
Pope Manufacturing Company, com	30	32	8	12
Pope Manufacturing Company, pfd	74	75½	33	38
Portage Rubber Co., com	..	..	..	40
Portage Rubber Co., pfd	..	..	..	90
Reo Motor Truck Company	9	10	..	10
Reo Motor Car Company	22½	23½	..	20
Rubber Goods Mfg. Co., pfd	..	..	100	110
Studebaker Company, com	36	38	22	25
Studebaker Company, pfd	93	95	80	87
Swinehart Tire Company	104	106	84	86
U. S. Rubber Co., com	..	..	57	58
U. S. Rubber Co., 1st pfd	..	..	101½	102
White Company, preferred	107½	108½	102	104
Willys-Overland Co., com	..	..	55	60
Willys-Overland Co., pfd	..	..	84	90

*Ex-dividend.

Bids Opened for P.O. Cars

Large Number of Bidders on Hand To Secure the Contracts for U. S. Mail Carrying Vehicles

WASHINGTON, D. C., June 21—With a large number of representatives of bidders in attendance, the purchasing agent of the post office department yesterday opened bids for furnishing twenty or more four-wheeled and twenty or more three-wheeled motor driven vehicles for use in the postal service as they may be ordered during the remainder of the fiscal year ending June 30, 1913. The specifications call for four-wheel gasoline and electric cars and three-wheel gasoline and electric machines. The detailed bids were as follows:

The White Co., Cleveland, O., four-wheel gasoline trucks: in lots of five, delivered in 21 days, $2,060 each, equipped with pneumatic or cushion tires, and the same price in lots of ten or more, delivered in 42 or 60 days, with the same type of tire equipment.

General Vehicle Co., Long Island City, N. Y., electric four-wheel cars: in lots of five, with different tire equipment, $2,690, $3,340, $2,865; in lots of ten, $2,690, $3,340, $2,865; in lots of fifteen, $2,620, $3,280, $2,805; in lots of twenty, $2,550, $3,220, $2,745; in lots of twenty or more, $2,480, $3,160, $2,685.

Walker Vehicle Co., Chicago, Ill., four-wheel electric, delivered within 60 days in lots of five, $2,962, $2,362, $2,462, $2,917, $2,317, $2,417; delivered within 60 days in lots of ten, $2,917, $2,317, $2,417; delivered within 70 days in lots of fifteen, $2,872, $2,272, $2,372; delivered within 90 days in lots of twenty, $2,822, $2,227, $2,327; delivered within 90 days in lots of twenty or more, $2,827, $2,227, $2,327.

Missouri Motor Car Co., St. Louis, Mo., four-wheel gasoline cars: in lots of five, delivered within 30 days, $1,316, $1,350; in lots of ten, delivered within 40 days, $1,303, $1,335; in lots of fifteen, delivered within 50 days, $1,290, $1,325; in lots of twenty, delivered within 60 days, $1,277 $1,310; in lots of twenty or more, delivered within 90 days, $1,265, $1,300; three-wheel gasoline cars: in lots of five, $780, $805; in lots of ten, $772, $800; in lots of fifteen, $765, $790; in lots of twenty, $758, $785; in lots of twenty or more, $750, $780.

Ward Motor Vehicle Co., New York City, four-wheel electric cars: in lots of five, delivered within 60 days, $2,275.25, $2,037.35; delivered within 90 days, in lots of ten, $2,215.38, $1,984.13; in lots of fifteen, delivered within 90 days, $2,155.50, $1,930.50; delivered in 120 days, in lots of twenty, $2,095.63, $1,876.88; in lots of twenty or more, $2,035.75, $1,823.75.

Atlantic Vehicle Co., Newark, N. J., four-wheel electric cars: in lots of five, delivered in 45 days, $2,350, $2,660, $3,100; in lots of ten, delivered within 50 days, $2,325, $2,550, $3,050; in lots of fifteen, delivered within 60 days, $2,270, $2,500, $3,000; in lots of twenty or more, delivered within 90 days, $2,200, $2,400, $2,950.

Baker Motor Vehicle Co., Cleveland, O., all deliveries within 60 days: in lots of five, $2,350, $2,280; in lots of ten, $2,280, $2,255; in lots of fifteen, $2,255, $2,230; in lots of twenty, $2,230, $2,205; in lots of twenty or more, $2,230, $2,205.

Mac-Carr Co., Allentown, Pa., four-wheel gasoline cars: in lots of five, delivered within 30 days, $1,500 for both pneumatic or cushion tires; in lots of ten, delivered within 45 days, $1,475; in lots of fifteen, delivered within 60 days $1,450; in lots of twenty, delivered within 75 days, $1,425; in lots of twenty or more, delivered within 90 days, $1,400.

Kissel Motor Car Co., Hartford, Wis., four-wheel gasoline cars: in lots of five, delivered within 40 days, $1,550, $1,610; in lots of ten, delivered within 60 days, $1,475, $1,535; in lots of fifteen, delivered within 75 days, $1,475, $1,535; in lots of twenty or more than twenty, delivered in 75 and 120 days respectively, $1,475, $1,535.

Brockway Motor Truck Co., Cortland, N. Y., four-wheel gasoline cars; with cushion tires: delivered in lots of five, $1,700; lots of ten, $1,650; lots of fifteen, $1,625; lots of twenty, $1,600; lots of twenty or more, $1,600; deliveries are in 60, 90 and 120 days.

Waverley Co., Indianapolis, Ind., four-wheel electric cars: in lots of five, delivered within 70 days, $1,820; in lots of ten, delivered within 85 days, $1,780; in lots of fifteen, delivered within 100 days, $1,755; in lots of twenty, delivered within 110 days, $1,735; in lots of twenty or more, delivered within 110 days at the rate of two per week, $1,725.

W. H. McIntyre Co., Auburn, Ind., four-wheel gasoline cars: in lots of five, delivered within 60 days, $1,735, $1,675; in lots of ten, delivered within 70 days, $1,730, $1,700; in lots of fifteen, delivered within 80 days, $1,682.95, $1,624.75; in lots of twenty, delivered within 90 days, $1,648.25, $1,591.25.

Kelsey Motor Co., Hartford, Conn., three-wheel gasoline cars: in lots of five to twenty, and twenty or more, deliveries within 90 days, $800 and $850.

Buffalo Electric Vehicle Co., Buffalo, N. Y., four-wheel electric cars, $1,890, $1,885, $1,880, $1,875, $1,868, $1,860, $1,855, $1,850.

Lippard-Stewart Motor Co., Buffalo, N. Y., four-wheel gasoline cars: in lots of five delivered within 60 days, $1,752.57, $1,692.59; in lots of ten, delivered within 70 days, $1,722.59, $1,692.59; in lots of fifteen, delivered within 75 days, $1,722.59, $1,692.59; in lots of twenty, or more, delivered within 80 days, $1,722.59, $1,692.59.

Public Service Motor Co., New York City, four-wheel electric car: in lots of five, delivered within 15 days, $1,660 for either pneumatic or cushion tire equipment; in lots of ten, delivery within 60 days, $1,620; lots of fifteen, delivery within 70 days, $1,580; in lots of twenty, delivery within 80 days, $1,540; lots of twenty or more, delivery within 100 days, $1,540.

Brown Commercial Car Co., Peru, Ind., four-wheel gasoline cars: in lots of five, delivery, 10 days, $1,650; L, 900; lots of 10, delivery, 20 days, $1,500, $1,750; lots of fifteen, delivery, 30 days, $1,490, $1,740; lots of twenty, delivery, 40 days, $1,450, $1,700; lots of twenty or more, delivery 40 days, $1,420, $1,670.

Atterbury Motor Car Co., Buffalo, N. Y., four-wheel gasoline cars: in lots of five, delivered within 45 days, $1,760 for either pneumatic or cushion type of tires; in lots of ten, delivery, 60 days, $1,742; lots of fifteen, delivery, 75 days, $1,724.80; lots of twenty, delivery, 90 days, $1,707.20; lots of twenty or more, delivery 90 days, $1,672.

Palmer-Moore Co., Syracuse, N. Y., four-wheel gasoline cars: ten, $1,125.

Argo Electric Vehicle Co., Saginaw, Mich., four-wheel electric cars: lots of five, delivery, 60 days, $1,750, $1,825; lots of ten, delivery, 75 days, $1,725, $1,800; lots of fifteen, delivery, 90 days, $1,700, $1,775; lots of twenty or more, delivery, 90 days, $1,700, $1,775.

Durant-Dart Carriage Co., Flint, Mich., four-wheel gasoline cars: lots of five, delivery, 60 days, $1,550, $1,575; lots of ten, delivery, 60 days, $1,453.50, $1,487.50; lots of fifteen, delivery, 60 days, $1,453.50, $1,487.50; lots of twenty, delivery, 60 days, $1,368, $1,400; lots of twenty or more, delivery, 60 days, $1,368; $1,400.

Commercial Truck Co. of America, Philadelphia, Pa., four-wheel electric cars: lots of five, delivery, 60 days, $2,170, $2,310; lots of ten, delivery, 60 days, $2,130, $2,270; lots of fifteen, delivery, 90 days, $2,085, $2,220; lots of 20, delivery, 90 days, $2,045, $2,185; lots of twenty or more, delivery, 90 days, $2,045, $2,185.

Harley-Davidson Motor Co., Milwaukee, Wis., three-wheel gasoline cars: lots of five, delivery in 60 days, $425; lots of ten, $425; lots of fifteen, delivery, 80 days, $403; lots of twenty or more, delivery, 90 days, $403.

Utility Car Co., New York City, three-wheel gasoline cars: in lots of five to twenty or more, delivery within 60 days, $500.

National Contracting Co., New York City four-wheel M. C. electric: lots of five, delivery, 20 days, $1,600, $1,750; lots of ten, delivery, 30 days, same price; lots of fifteen to twenty, or more, delivery, 60 days, $1,550, $1,700; four-wheel gasoline cars, Chase and Sanford makes; lots of five, $1,450, Chase; $1,910, Sanford; delivery, 35 days; same prices in lots of ten, fifteen and twenty; lots of twenty or more, $1,400 and $1,875.

Palmer-Myer Motor Co., St. Louis, four-wheel gasoline cars: in lots of five to twenty and above, $1,650.

Krebs Commercial Car Co., Clyde, O., four-wheel gasoline cars in lots from five to twenty and over, deliveries within 40, 50 and 60 days, $1,600.

Dart Mfg. Co., Waterloo, Ia., four-wheel gasoline cars; in lots from five to ten, deliveries, 30 and 45 days, $1,625, $1,515; lots from fifteen to twenty and over, deliveries, 45 days, $1,600, $1,490.

Autocar Co., Ardmore, Pa., any number desired, $1,800 for chassis and $200 for body.

Overland-Washington Motor Co., Washington, D. C., in lots of from five to twenty, deliveries, 60 to 120 days, $950.

Stewart Motor Corporation, Buffalo, N. Y., lots of five, delivery, 30 days, $1,850; lots of ten, delivery, 40 days, $1,775; lots of fifteen, delivery, 45 days, $1,700; lots of twenty and over, delivery, 50 days, $1,625.

C. B. B. Motor Co., Washington, D. C., in lots of five, delivery, 30 days. $1,428, $1,348; lots of ten, $1,428, $1,348.

Wagenhals Motor Co., Detroit, Mich., three-wheel gasoline cars: in any lots up to twenty, $665 and $690, delivery within 30 days; over twenty, same delivery, $625 and $650.

Kentucky Wagon Mfg. Co., Louisville, Ky., four-wheel electric: in lots of five or more, deliveries, 75 to 150 days, $1,690, $1,793, $2,104.

A. Loffler Co., Washington, D. C.: lots of five, delivery, 90 days, $1,850, $1,950; lots of ten, delivery, 90 days, $1,825, $1,925; lots of fifteen, delivery, 100 days, $1,800, $1,900; lots of twenty, delivery, 120 days, $1,775; $1,875; lots of twenty or more, delivery, 150 days, $1,750, $1,850.

Thos. B. Jeffery Co., Kenosha, Wis.: lots of five, delivery, 40 days, $1,410, $1,460; lots of ten, delivery, 45 days, $1,364, $1,414; lots of fifteen, delivery, 50 days, $1,332, $1,382; lots of twenty or more, delivery 60 days, $1,300, $1,350.

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FOSTORIA, O., June 21—The stockholders of the recently-incorporated Allen Motor Car Co. have elected E. W. Allen president and W. O. Allen treasurer and general manager. J. E. Wright, formerly with the Columbia Buggy Co., of Hamilton, O., will be active in the concern. Plans have been prepared for a two-story plant, 225 by 65 feet.

Market Changes of the Week

Tin dropped this week to $43.75, a loss of $1.25 per 100 pounds. Lead was quiet, though it fluctuated throughout the week. At the close on Tuesday it was calling at the Metal Exchange at $4.35, a gain of $.02 1-2 per pound. A slightly stronger tone was developed in both electrolytic and Lake coppers. Both coppers dropped $.00 1-8 per pound. Antimony was dull, remaining constant at $.07 1-2 per pound. Beams and channels, Bessemer steel, and open-hearth steel remained unchanged. Cottonseed oil for July passed the 8-cent mark on Tuesday, but did not remain there very long, dropping back again 4 or 5 points during the later session. The advance of $.30 per barrel was hardly to be explained upon any basis in connection with the day's news developments, but the impression seemed to be growing that it was very largely the result of artificial support by the bit refining companies. Both petroleums from the Kansas and Pennsylvania wells remained firm at their old prices, $.88 and $2.50 a barrel, respectively. The rest of the products in the chemical and oil markets also remained unchanged.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07½	.07½	.07½	.07½	.07½	.07½	.....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	.....
Copper, Elec., lb.	.14¾	.14⅞	.14½	.14¼	.14⅞	.14½	— .00½
Copper, Lake, lb.	.14⅞	.14⅞	.14⅝	.14⅜	.14⅛	.14¾	— .00⅛
Cottonseed Oil, lb.	7.62	7.70	7.80	7.80	7.90	7.92	+ .30
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gals.	.22¼	.22¼	.22¼	.22¼	.22¼	22¼	.....
Lard Oil, prime	.95	.95	.95	.95	.95	.95	.....
Lead, 100 lbs.	4.32½	4.37½	4.37½	4.37½	4.35	4.35	+ .02½
Linseed Oil	.47	.47	.47	.47	.47	.47	.....
Open-Hearth Steel, ton	26.50	26.50	26.50	26.50	26.50	26.50	.....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, raw Italy	....	4.50	....	....	4.50	4.60	+ .10
Silk, raw Japan	....	3.77½	....	....	3.80	3.92½	+ .15
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	45.00	43.50	43.50	43.25	43.45	43.75	—1.25
Tire, Scrap	.10	.10	.10	.10	.10	.10	.....

Stanolind Saves Money

Automobilists Quick To Take Advantage of New Standard Oil Fuel —Gasoline Is Not To Rise in Price

CHICAGO, ILL., June 21—The discovery of Motor Spirits, now known familiarly as Stanolind, has saved the automobilists of the ten states served by the Standard Oil Co. of Indiana thousands of dollars since last fall and will save them still more during the present summer through the lessening of the demand for gasoline by owners of stationary engines and tractors. Since Stanolind came on the market there has been no change in the price of gasoline by the Standard Oil Co. of Indiana, and, according to General Manager P. C. Crenshaw, the price will remain the same for some time to come—15 cents f.o.b. Whiting.

The Standard Oil Co. of Indiana is the owner of Motor Spirits and at the present time is manufacturing 100,000 gallons a day at its Whiting plant and 50,000 a day at Wood River. It only recently licensed the Standard Oil Co. of New York and the Standard Oil Co. of Kansas, so that Stanolind soon will be within reach of the majority of the motorists of the United States.

When the new fuel first was put on the market the company had no idea of using it for passenger cars, the idea being that if the owners of stationary engines, tractors and even motor trucks would use Motor Spirits it would relieve the situation in the gasoline field. However, owners of passenger motor cars took kindly to the proposition and soon it was discovered that Motor Spirits makes a most excellent substitute for gasoline. Tests made by the Stromberg Motor Devices Co., of Chicago, as reported in THE AUTOMOBILE at the time, showed that Motor Spirits gave practically the same results as gasoline, while since that time the Standard Oil Co. of Indiana has received many letters from users testifying to the efficiency of Stanolind.

The Gray Motor Co., Detroit, Mich., recently tried out three fuels—gasoline, Motor Spirits and kerosene—using a 6-horsepower 6 by 8-inch stationary engine in one test and a 10-horsepower 5¾ by 5-inch two-cycle marine engine in the other. With the former the results were: Gasoline, 1.13 pints per brake horsepower; Motor Spirits, 1.32 pints per brake horsepower; kerosene, 1.45 pints per brake hosepower. These readings were taken when the engine was adjusted to deliver the exact brake horsepower on the three fuels.

With the larger engine, the results varied from the results obtained on the four-cycle engine, showing a slight loss in power, whereas in the four-cycle the tests showed an increase of 5 per cent. in power.

The Emerson-Brantingham Implement Co., Rockford, Ill., recommends Motor Spirits to owners of Big Four engines and states unqualifiedly that Motor Spirits gives 15 per cent. more power than kerosene and that the economy is greater.

The Otto Gas Engine Works, Philadelphia, has a report from its engineer which shows that its 21-horsepower engine under full load consumes but .753 pint of Motor Spirits per horsepower hour as against .781 of gasoline.

The J. I. Case Threshing Machine Co., which makes tractors in addition to motor cars, testifies that tests made with Motor Spirits in tractor engines of various sizes show that the new fuel gives as good results as gasoline both in horsepower and economy. It also finds that the motors, if anything, will start more readily on Motor Spirits than with any commercial grade of gasoline.

E. D. Kritz, Ford agent at Charles City, Ia., writes that he has been using Motor Spirits in all Ford cars for several weeks and that it is giving satisfaction and that on new cars it works better than basoline and gives more power. Booth & Probert, Ford agents at West Union, Ia., declare that it gives at least 15 per cent. more power than gasoline, and that after a 300-mile run an examination of the spark plugs failed to disclose any carbon deposit. O. J. C. Kenning, a Buick owner at Grand Rapids, Mich., claims greater mileage and more power on the hills.

Owners of motor trucks are even more commendatory in their remarks regarding Motor Spirits, and among those using it at the present time are Koehler & Hinrichs, St. Paul; the Peter J. Seippel Lumber Co., Dubuque, Ia.; Wyeth Hardware & Mfg. Co., St. Joseph, Mo.; Frank Reter, Clinton, Ia.; Ottumwa Bottling Works, Ottumwa, Ia.; Dennis Bros., Dubuque, Ia.; Brooks Bros., Minnesota Transfer, Minn.; Eggert Transfer Co., Muskegon Heights, Mich.; Canfield Lumber Co., Waterloo, Ia.; Roshek Bros. Co., Dubuque, Ia.; Hesse Building Material Co., St. Joseph, Mo.; Bissell Laundry Co., Chicago; Villaume Box & Lumber Co., Chicago.

Big Increase In April Tire Exports

WASHINGTON, D. C. June 24—March automobile exports remained stationary. April figures show only a slight loss. During last April the total value of automobiles and parts exported was $3,469,891, as contrasted with $3,514,210 during the previous month, and with $2,726,500 for April, 1912. The April, 1913, total value of both automobiles and parts was $3,469,891, while the total for the same month last year was $2,726,500. Automobile tires jumped to $305,362 last April, from $194,132 in April, 1912. The tabulation of the number and value of the machines taken by the various countries shows gains in nearly every one, the notable exception being the United Kingdom, which shows a loss of 206 machines, having taken only 373, value $292,167, during last April, as contrasted with 597, value $463,560, in April, 1912.

Automobile motors showed a drop last April, only 954 motors being exported, as against 1,458 in April, 1912. The value increased, however, from $139,335 to $189,783.

A table of the exports and imports follows:

Exports and Imports of Automobiles and Parts for April and the 10 Preceding Months

	April				Ten months ending April					
	1912		1913		1911		1912		1913	
Automobiles exported to:	Quantities	Values	Quantities	Values	Quantities	Values	Quantities	Values	Quantities	Values
France	104	$66,683	144	$99,300	230	$373,429	444	$370,836	645	$498,900
Germany	64	46,735	108	104,095	76	177,626	212	153,721	500	486,448
Italy	21	16,181	43	34,865	106	152,515	139	122,247	271	235,363
United Kingdom	579	463,560	373	292,167	1,648	1,652,076	4,716	3,765,765	3,120	2,382,752
Other Europe	169	132,093	262	224,606	441	531,693	858	715,186	1,307	1,132,207
Canada	809	1,004,638	1,048	1,326,079	3,295	3,556,243	4,424	5,181,232	5,967	7,381,109
Mexico	16	22,291	10	15,950	318	564,118	258	394,759	259	491,871
West Indies and Bermuda	43	34,415	30	28,957	232	302,247	270	282,381	370	382,515
South America	131	167,911	243	287,404	523	639,677	1,282	1,553,629	2,438	2,729,313
British Oceania	134	137,124	169	184,649	1,156	977,153	3,034	2,725,047	2,510	2,361,867
Asia and other Oceania	140	160,215	201	192,594	549	593,194	849	889,368	1,743	1,672,113
Other countries	28	28,353	135	113,558	209	228,659	321	315,976	966	912,135
Total	2,238	$2,280,199	2,766	$2,904,224	8,783	$9,748,630	16,807	$16,470,147	20,096	$20,666,593
Parts of (not including engines and tires)	...	446,301	...	565,667	...	1,875,415	...	3,296,348	...	4,153,472
Total automobiles and parts of	...	$2,726,500	...	$3,469,891	...	$11,624,045	...	$19,766,495	...	$24,820,065
Alaska—										
Automobiles	1	$500	2	$2,200	1	$850	11	$9,085	7	$10,250
Parts of (except engines and tires)	...	882	...	60	...	1,114	...	3,680	...	1,964
Hawaii—										
Automobiles	28	42,864	96	156,186	328	642,757	410	715,009	631	1,047,724
Parts of (except engines and tires)	...	3,156	...	7,073	...	51,952	...	61,096	...	92,793
Porto Rico										
Automobiles	33	41,611	20	26,371	213	436,789	342	528,995	287	356,693
Parts of (except engines and tires)	...	7,964	...	8,773	...	83,082	...	100,501	...	78,162
Philippines—										
Automobiles	73	96,786	65	73,995	286	360,168	311	422,297	410	487,835
Parts of (except engines and tires)	...	16,966	...	2,939	...	54,723	...	55,220	...	43,397
Imported from:										
France	34	74,489	14	28,069	322	666,065	339	818,564	320	749,584
Germany	8	20,075	7	20,199	83	189,180	108	240,393	82	214,372
Italy	3	7,579	10	21,866	109	204,895	115	171,706	103	175,167
United Kingdom	10	23,817	4	12,783	97	228,621	170	389,182	74	210,332
Other countries	4	7,896	9	23,151	85	195,522	113	247,650	83	190,672
Total	59	$133,856	44	$106,068	696	$1,484,283	845	$1,867,495	662	$1,540,127

Illinois for Good Roads

Legislature Has Set Aside $400,000 for State Roads Beginning July 1, 1913 — To Use Convict Labor

SPRINGFIELD, ILL., June 21—The Illinois legislature adjourned last night and one of its last acts was to enact into a law the good roads measure. It didn't pass in its original form as prepared by Representative Tice but the bill contains many features agreeable to the motorists and is regarded as a step in the right direction.

The legislature remedied the oversight which prevented the use of registration fees for road maintenance and has set aside $400,000 out of the fund for the use of the highway commission for the year beginning July 1, 1913, in the construction of state-aid roads. A similar sum was given for the previous year. Appropriations from the general fund of $300,000 each for the years 1913 and 1914 for the state highway commission to build and maintain state-aid roads were made. Sheridan road, running north to Milwaukee, was placed under control of the Lincoln park commissioners to the Wisconsin state line.

Illinois also has come out for the employment of convict labor on roads, one of Governor Dunne's administration measures. The new law provides that upon the request of highway commissioners in any township or county board the commissioners of the Joliet or Chester penitentiary or the board of managers of the Pontiac reformatory may detail prisoners for the employment on the public roads or in the preparation of road-building material.

The new road law provides for the reorganization of the road-building system of the state under the direction of three members to be appointed by the governor, the salaries to be $3,500 each per year for a 6-year term.

Keystone Governor Approves Jones Bill

HARRISBURG, PA., June 23—Governor John K. Tener has approved the Jones bill, appropriating $1,000,000 to pay the 50 per cent. bonus on cash tax in second class townships. The bill provides for the deficiency which has arisen because of insufficient appropriations by the 1911 legislature.

INDIANAPOLIS, IND., June 25—*Special Telegram*—The Severin Taxicab Co. is being organized here with $100,000 capital. It will operate twenty-five taxicabs and establish a garage with capacity for 100 cars.

Brazil Wants Automobile Factories

NEW ORLEANS, LA., June 20—Now that Brazil has made arrangement for several rubber factories, the next effort is to be directed toward getting automobile factories. A plan already is being considered by the industrial department of the government, which will provide for a subsidy sufficient to encourage the location of a branch plant of an established concern manufacturing a standard car. As the government came to the United States for its rubber manufacturers it is considered probable that preference will be shown Americans in the contemplated enterprise.

A. O. Smith Passes Away

MILWAUKEE, WIS., June 23—The automobile and motor truck industry lost a conspicuous figure when A. O. Smith, president and founder of the A. O. Smith company, passed away on June 20. Mr. Smith was 54 years old and had been in poor health for several months. L. Raymond Smith, who has been his father's right-hand man for several years, will succeed him as head of the company and general manager of its business.

Stearns Co. To Expand—Raises Capital

CLEVELAND, O., June 21—Appplication has been made by the F. B. Stearns Co., for an increase of $200,000 in its capital stock. Some time ago several parties heavily interested in the company acquired control of nearly 400 feet of Euclid avenue frontage adjoining the Stearns factory on the west and extending back to the Belt Line R. R. tracks, which circle the city. It is now advisable for the stockholders of the company to acquire this additional land to provide for extensions of the business.

An agreement has accordingly been reached whereby the company acquires control of this land by an exchange of the Realty company's securities for stock of the Stearns concern under certain conditions, $47,000 of this stock being issued for this purpose and the balance retained in the treasury. The Stearns company has increased its stock to effect this exchange and has in contemplation considerable new construction.

United Motor Chicago Co. Bankrupt

CHICAGO, ILL., June 25—*Special Telegram*—A voluntary petition in bankruptcy has been filed by the United Motor Chicago Co., formerly the Maxwell-Briscoe Chicago Co., representing the United Motors Co., before the reorganization. The liabilities were placed at $108,140.54 and the assets at $27,173.

Studebaker Strike Is Over

DETROIT, MICH., June 25—*Special Telegram*—While the strike at the Studebaker plants here was not officially called off by its instigators until last night, the big corporation has been running with a full force all week and is turning out as many cars as usual. Although the concern did not stop building automobiles during the strike period it was, of course, not running to full capacity at that time. At no time, however, were more than 2,800 men out which is only about one-quarter of the total working force so that manufacturing was not seriously crippled at all.

American Voiturette a New Small Car

DETROIT, MICH., June 24—The second of the small cars to make its debut in Detroit is one of the models to be turned out in quantities by the American Voiturette Co., a $500,000 concern which has for its backers C. B. Shaffer, President, and W. G. Houck, director of sales and second vice-president of the Keeton Motor Co., and others. The company plans to make three models, a tandem, for carrying two persons; a roadster for two side by side, and a four-passenger type. These are to sell for $495, $505 and $510, respectively.

Sixty Men Strike at Adams Plant

FINDLAY, O., June 20.—Sixty men in the machine shop of Adams Bros. motor truck works went out to-day because of the intolerance, as they allege, of two men, foreman and superintendent, imported from Detroit. The plant is turning out five trucks a week, and the new men say the output should be twelve. No violence has resulted.

Cars Not Allowed in Yellowstone

WASHINGTON, D. C., June 22—Some time ago announcement was made that Secretary of the Interior Lane had thrown open Yellowstone National Park to motor cars. Officials of the department say that is manifestly incorrect and they are at a loss to account for the wide publicity given the matter. As a matter of fact, motor cars are not permitted in the park except on that part of the road from Bozeman, Mont., to Yellowstone, Mont. The department is endeavoring to get an appropriation of $2,000,000 from Congress in order to widen the roads leading into the park.

Bretz Outing Great Success

NEW YORK CITY, June 25—The J. S. Bretz outing, which was held yesterday on Staten Island, was one continuous round of pleasure for the magazine, newspaper and automobile men who were the guests. Cricket, baseball, field sports and tennis tournaments made the time slip merrily away.

The Carriage and Wagon Industry in 1909

WASHINGTON, D. C., June 21—Statistics in detail of the carriage and wagon industry of the United States for 1909 are presented in a bulletin soon to be issued by Director Durand of the Bureau of the Census, Department of Commerce. The 5,492 establishments in both branches of the carriage and wagon industry of the United States gave employment in 1909 to an average of 82,844 persons, of whom 69,928 were wage earners, and paid $45,555,126 in salaries and wages. The carriage and wagon industry has existed in this country since early Colonial times, and its growth up to the census of 1904 about kept pace with the increase of population. The advent of the automobile, and later of the motor truck, has had a decidedly retarding influence on the industry. Many establishments in the early days manufacturing carriages have turned to the manufacture of automobiles.

The following table gives the figures in detail:

	Carriages and Wagons and Materials				
	Number or amount			Per cent. of increase*	
	1909	1904	1899	1899-1909	1904-1909
Number of establishments	5,492	5,588	6,792	—19.1	— 1.7
Persons engaged in the industry	82,944	90,751	(a)	....	— 8.6
Wage earners (average number)	69,928	77,882	73,812	— 5.3	—10.2
Capital	$175,473,728	$152,344,657	$128,961,660	36.1	15.2
Wages	37,594,919	38,362,679	33,565,313	12.0	— 2.0
Value of products	159,892,547	155,868,849	138,261,763	15.6	2.6

*A minus sign (—) denotes decrease. Where percentages are omitted, comparable figures cannot be given. (a) Comparable figures not available.

Franklin Breaks Fuel Economy Record

Covers 86.6 Miles on 1 Gallon of Gasoline—Record Was 46.1 Miles Held by 1913 Franklin

NEW YORK CITY, June 21—Yesterday a specially-constructed Franklin car broke the record for the distance traveled by an automobile on a gallon of gasoline, going a distance of 86.6 miles over Long Island roads.

The former record for an automobile was 46.1 miles and was held by a 1910 Franklin car weighing, with passengers, 2,948 pounds. The motor was an 18-horsepower type and the car carried a touring body. The car which made the present record is equipped with a sheet aluminum body in the form of a two-seated roadster with torpedo lines. The weight of the empty car in running condition is 1,695 pounds. Its total weight with the driver and passenger is 1,995. The former record was made in competition in July, 1909, while the present record was made as a test under the supervision of the Automobile Club of America.

The driver was S. G. Averill, the owner, who was accompanied by Herbert Chase, laboratory engineer of the Automobile Club of America, who acted as official observer. Mr. Averill was also the driver of the car making the record in 1909. The car he drove at that time was one of the first of the 1910 Franklins. In this competition Averill exceeded the mileage of his nearest opponent by 20.4.

Everything was done to reduce the coasting resistance of the car used in this trial for the record. Ball bearings were placed on the rear axle, a Newcomb carbureter fitted, the spring cut down so that there were but four blades in each half of the elliptic front and rear springs, the drive was taken through the springs and through one rear wheel, the other running free. One set of brakes, controlled by the hand, was used, 34 by 3.5-inch plain clincher tires pumped to a pressure of 35 pounds were fited. The brake drums were even perforated to bring the weight to its absolute minimum. Wind resistance was cut down by using the stream-line torpedo body, which carried a tapering cowl to cut the resistance.

The gasoline used was 63 Beaumé test carried in a measured copper receptacle on the dash before the observer's seat. This was fed by gravity to the Newcomb carbureter which was standard except that the easy-starting, air shut-off valve was omitted. The odometer used was a Casgrain.

The course followed was on the Queens boulevard. The car traveled from the Williamsburg bridge out Queens boulevard to Hillside avenue, Jamaica, swinging left to the Jericho turnpike which was followed to the hamlet of Jericho where a turn was made across the island and then back over the same roads to the starting point. On the return to the starting point it was found that a little better than 60 miles had been covered and that some gasoline still remained. The remaining 20 miles was covered by a trip out Jackson avenue, and back and then another out the same route and nearly back to the starting point, so that the car went up practically every grade that it went down, although at times it seemed as if the car was fairly coasting up grade, so easily did it run.

Country passed through on the Franklin test was fairly level with an occasional 2 or 3 per cent grade. The test lasted six hours, which makes an average speed over the entire distance of 14.5 miles per hour on regular touring speed. The driver would open his throttle until he had attained a speed of close to 20 miles an hour and then would stop the motor and coast.

It has always been a fascination to determine what mileage can be secured from a gallon of gasoline. A motorcycle has traveled 190 miles on 1 gallon and 10 ounces. This was done by S. A. Baker, September 13, 1907. The average accomplishments, however, of stock models with regular bodies fall far below these record tests. The average gasoline automobile travels from 15 to 20 miles on a gallon, although some touring cars go as low as 4 miles to the gallon and others as much as 28. The average steam automobile goes 10 miles to the gallon. The average aeroplane 10 miles to the gallon, but with its fuel mixed with lubricating oil. The average motorboat of corresponding horsepower to an automobile goes about 12 miles to the gallon, while a single-cylinder motorcycle will average better than 75. The strength of gasoline may be fully appreciated from the fact that it has been stated that could the entire energy contained in 1 pound be utilized it would lift a 1-pound weight 15,941,220 feet.

Elgin Entry Blanks Now Ready

CHICAGO, ILL., June 23—Entry blanks for the fourth annual Elgin road races, scheduled for August 29-30, were issued today by the Chicago Automobile Club, providing for two races only, the 300 and under class for the Cobe cup the first day and the 450 and under for the Elgin national trophy the second day. Hardly had the blanks been out before the first entries were made. E. C. Patterson, general manager of *Collier's Weekly*, nominating two Mercedes six-cylinders for the second day's race. One of these will be driven by Victor Hemery and the other by Theodore Pilette, the two foreigners.

Many Entries for Columbus Races

COLUMBUS, O., June 21—Entries for the 200-mile sweepstakes automobile race to be held at the Columbus Driving Park, July 4, under the auspices of the Columbus Automobile Club, are coming in fast. The contest committee of the Columbus Automobile Club has received word of the entry of De Palma in a Mercer, Spencer Wishart also in a Mercer, Fritsch in a Cino, Rickenbacher in a Mason, either Ralph Mulford or Houpt in a Mason, Whalen in a Schacht and others. In order to furnish sufficient seating capacity the committee has arranged for 8,000 circus seats to be placed to the south of the grandstand which will increase the seating capacity to about 20,000.

Ohio Wins Special Match Race

CINCINNATI, O., June 21—A special match race between Johhny Raimey in an Ohio "99" and Horace Heisey in a Buick "40" supplied the feature of an otherwise tame program in the annual hill climb of the Cincinnati Automobile Dealers' Association today. Heisey won by negotiating the course in 0:29 3/5 on his first attempt. Both dare-devils got two trials. On his second spin up the hill Heisey was slow, 0:33 3/5 being his time. Raimey's best was 0:29 4/5. Both are local drivers. The course is 100 yards less than a half mile.

The entry list was a small one. In some races only one car went up the hill. No outside drivers of note could be induced to come here for the meet. Over 10,000 people thronged the course, which was in splendid condition. The weather was very hot. The only accident during the day occurred in the second race, when H. D. Shane in a Metz swerved in going around a curve and bumped into a tree.

L. I. A. C. To Hold Run for Jordan Trophy

NEW YORK CITY, June 24.—The Long Island Automobile Club will hold a 3-day run to the Berkshires for the Jordan trophy, Friday, July 4, to Monday, July 7. There will be 2 days of actual running. Penalties will be imposed for taking on water, gasoline or oil between the controls, Poughkeepsie, Pittsfield and Waterbury. The club will also hold a secret time run to Babylon, L. I., July 4, for the Major cup.

COLUMBUS, O., June 21—After parleying around for several weeks, the Ohio State Journal Reliability contest which had been postponed several times, was officially called off by the contest committee of the Columbus Automobile Club. This was done after it became too hot for the race to be run with comfort.

Franklin car which broke fuel economy record

Zuccarelli Killed in Practice Run

Driving at 100 Miles Per Hour on Grand Prix Course, Hits Wagon—Mechanician Dies

PARIS, FRANCE, June 19—*Special Cable*—Paul Zuccarelli, one of the Peugeot drivers who recently returned from the 500-mile race at Indianapolis, was killed outright and his mechanician, Fanelli, was mortally wounded today when the racing car in which they were practicing for the French Grand Prix collided with a farmer's wagon, which suddenly emerged from a side road between Nonancourt and Evreux.

Zuccarelli's car was speeding at nearly 100 miles an hour when the accident occurred, the automobile driving straight through the cart but overturning on top of the occupants.

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PARIS, FRANCE, June 13—Jules Goux, winner of the Indianapolis 500-mile race, and his team-mate Paul Zuccarelli, landed at Havre this week, where they were met by Georges Boillot and the European representative of THE AUTOMOBILE. Stepping off the gangway of La France, Goux saluted Boillot in military style and said "Boss, you sent me to America to win the first prize; I've won it."

In conversation with THE AUTOMOBILE representative, Goux expressed himself as delighted with the treatment he had received at Indianapolis. "There was absolutely no favoritism, the Peugeot victory was well received, and the officials gave us every assistance. Carl Fischer and C. W. Sedwick were particularly attentive, and A. C. Newby, of the National Motor Car Company, placed his factory at our disposition. I doubt if it would be possible to find any maker in Europe who would do as much. It is almost certain that I shall run at Savannah next fall, and I shall be disappointed if I am not one of the starters in next year's race at Indianapolis."

Jules Goux declared he had never seen such magnificent organization in connection with an automobile race as that at Indianapolis. "There is nothing in the world to approach it. I consider the management perfect in every detail. The track is not fast, compared with Brooklands, for instance, and had it not been for the impossibility of taking the turns fast, consistent with the life of tires, I should have shown a much higher average. I consider that I had an easy win, and from the moment the start was given I felt confident that the race was in my hands.

"I was handicapped by being geared too high. My ratio was 2 to 1, which was the ratio adopted for road work with a cylinder bore of 110 mm. We had cut the bore down to 108 mm. and not changed the ratio. I found that in order to make my right rear tire last a reasonable length of time I could start my turns at 85 miles an hour, but had to finish them at not more than 73 miles. After being cut out on the bends the straightaways were not long enough to get the motor up to its highest number of revolutions. The fastest I could get on the straightaways, without considering the life of tires, was 99 miles an hour; with a suitable gear ratio I could have done 112 miles an hour. In consequence of this the motor was always running at a lower number of revolutions than that for which it was designed. At first I did my laps in 1.40, and could have kept to 1.45 throughout the race if it had been necessary. When I had got a couple of laps lead on my nearest competitor I considered there was nothing to be gained by going faster than 1.50 per lap. I broke last year's records up to 200 miles and could have broken them for the entire distance if there had been anybody really dangerous behind me. I hope that in next year's race the cylinder capacity will be reduced still more. With smaller motors and lighter cars it will be possible to get the same average speed as this year. I hope to prove this with our present season's Grand Prix racers."

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National Tour Promises Success

MINNEAPOLIS, MINN., June 23—With several entries already filed for the A. A. A. national reliability tour, Twin Cities-to-Glacier Park, July 11-19, others promised, and more than 100 interested applicants for information from all over the United States the outlook for a big field is said by Dr. C. E. Dutton, chairman of the tour, to be excellent. A meeting was held Tuesday noon, this week, at the Commercial Club between the Civic & Commerce Association tour committee, the general entries committee of the Automobile Club of Minneapolis, and the Minneapolis Automobile Trade Association at which the project was given a big push. The Mitchell Moose pathfinder, which has just completed laying the route to Glacier Park station with Frank X. Zirbs as driver and C. A. Stedman as pathfinder, will return at once to get ready to become pilot in the tour. David Beecroft of the contest board has been appointed referee.

The entries to date are:

Louis W. Hill, St. Paul, Packard 30, 1909 model, four cylinder runabout, 5 by 5½ inches, two passenger, Anderson trophy.

C. H. Metz and H. W. Metz, Waltham, Mass., G. H. Voter, Boston, Metz cars, 1913 model, A. A. A. trophy, Glidden trophy.

H. F. Legg, Minneapolis, Stutz, 1913 model, four cylinder runabout, 4¾ by 5½ inches, two passenger, Anderson trophy, and with Premier and Reo to be entered, the Anderson trophy.

H. W. Automobile Company, three Krit cars, 1913 model, four cylinder runabout, 3¾ by 4 inches, Glidden and Anderson trophies.

Dr. Clinton A. Smith, Devils Lake, N. D., KisselKar, 60, 1912 model, four-cylinder runabout, 4.5 by 4.75 inches, Anderson trophy.

Fawkes' Automobile, 60, Minneapolis, Premier, 1913 model, six-cylinder, 4.25 by 5.5 inches, Glidden, A. A. A. trophies (team with Stutz and Reo car to be entered).

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Indiana Makers Tour Ready to Start

INDIANAPOLIS, IND., June 23—Final arrangements for the Indiana-Pacific tour, under the auspices of the Indiana Automobile Manufacturers' Association and to start from here July 1, were made at a meeting held in this city last Tuesday night. The tour will start at 2 p. m. from University Park and there will be a large escort to the city limits. A letter has been sent to the mayor of each city through which the tourists will pass by Mayor Shank. Tourists are to wear khaki and puttees. Equipment will include an extra oil tank, a Compac sleeping tent, a suit case rack and a kitchen and lunch hamper. There are now twenty-two formal entries and may be more before the start.

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Franklin Wins in Watson Cup Run

SYRACUSE, N. Y., June 21—Edward F. Sparks, driving a Franklin car, won the secret time sociability run of the Automobile Club of Syracuse. The official time was 2:57:30 and Mr. Sparks was just 12 seconds distant from it, covering the route in 2:57:18. This gives him possession of the Watson cup for a year, and the plan is to have Mr. Sparks and the three previous winners of the cup hold a contest next year, the winner to retain the trophy permanently. Mr. Sparks also won 5 gallons of Monogram oil by coming nearest the secret time. The other winners, taking various automobile merchandise, in their order and cars, follow: Simon Rosenblood, Haynes; A. J. Conine, Buick; Louis Leonard, Krit; G. F. E. Meistering, Abbott-Detroit; C. A. Lawton, Franklin; Edward C. Heise, Cadillac. Miss Edith Gere won the women's prize of a camera outfit, also the Ford prize of a thermos bottle and case.

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Wisconsin Tour Pathfinder Starts

MILWAUKEE, WIS., June 23—The Mitchell 1914 6-60 pathfinder for the fourth annual Wisconsin reliability tour, under auspices of the W. S. A. A. left Milwaukee Saturday, June 21, to blaze the 800-mile trail which will be followed by the contestants in the run from August 18 to 22, inclusive. M. C. Moore, who will again do the pathfinding, has made some changes in the route, which at present is as follows: First day, Milwaukee to Appleton, 151.7 miles. Second day, Appleton to Marshfield, 191.5 miles. Third day, Marshfield to LaCrosse, 166.4 miles. Fourth day, LaCrosse to Madison, 150.2 miles. Fifth day, Madison to Milwaukee, 151.7 miles.

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Keeton Challenges Indianapolis Winner

DETROIT, MICH., June 23—Wm. G. Houck, director of sales and second vice-president of the Keeton Motor Co., has posted a check for $10,000 with the *New York World* as a challenge for Jules Goux, winner of the 500-mile race at Indianapolis on May 30, to race Bob Burman in the Keeton car, which also competed in that race. Goux is now in France preparing for the Grand Prix on July 15, and it is doubtful if he will accept the challenge.

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Gasoline Price Is Not To Rise

THAT "necessity is the mother of invention" has been well demonstrated in the automobile fuel field. On January 1 of this year the weekly supply of gasoline was approximately meeting the demands, but manufacturers were uneasy, they feared that demand might exceed supply and that the consequent increase in prices would result. At that time one of the large gasoline producing companies was working on a new fuel, motor spirits, now known as Stanolind, which has since its entering the market a few months ago practically eased the fuel market so that last week it was learned that there is no danger of any immediate rise in the price of gasoline. This is welcome news, particularly when it is remembered how there was a 50 per cent. increase a year ago and how at present the price in several European countries is going up steadily.

Motor spirit must be given much credit for the present stationary prices, because by means of it the amount of fuel from a gallon of crude has been practically doubled, the refinery getting the regular quantity of gasoline and an equal quantity of Motor Spirit from a gallon of crude, which has more than doubled the available supply.

While motor spirit was originally intended for farm tractor and stationary engine work and perhaps motor trucks, it has really been taken up quite extensively by the light car owners.

Quality Is Wanted in Tires

KEEPING step among the various departments that go to make up the motor car has been one of the factors largely instrumental in the phenomenal growth of the industry. Had the body building department lagged behind that of chassis design slower progress would have been made; so, too, had tire makers fallen in arrears the general progress would have been impeded. Tire makers have been particularly active, and although at one time the price of crude rubber rose so as to give rise to uneasiness, the prices are today back into normal channels; and so great are the improvements in rubber culture that there is little, if any, danger of any shortage in spite of the increasing number of motor cars and motor trucks being used.

Tire manufacturers have a difficult rôle to play because of the guarantee feature, and further because they have suffered badly due to poor roads as compared with other countries. A few years ago the tire cost per mile was much in the public eye, but with the increased price of fuel and other added costs to motoring the tire factor has moved slightly out of the limelight. The recent cuts in prices have had something to do with this, but it is questionable if price cutting is going to produce the looked-for results. Price cutting will be welcomed by the entire motor fraternity if quality is maintained, but it is a point for argument if improving the quality of the tire and retaining the price might not be a more desirable course.

If there is any part of the car in which maximum quality is looked for it is in the tire field. The continual demand for tire fillers and other protective measures against punctures and blowouts proves that the tire nightmare is still with many motorists; and while demountable rims, power air pumps and other conveniences have done their part, there are still looked-for improvements. If a better grade of fabric can be used in tires it will be welcomed; and if there are better methods of vulcanization, or improvements in any of the processes of tire building, the car owner would welcome everything possible by way of adopting them.

The use of larger tires must be looked upon as a step in the right direction and there are still today cars that are undertired. With several car builders the car weight has increased during the last two years. Batteries for motor starters have been added, motor starters have increased the weight. Demountable rims have added a few pounds; and the full dinner pail equipment has added weight. In some cases the car builder has been fitting the same size of tire and when vehicles have been weighed both tire maker and car maker have acknowledged that the tires were not adequate to the load. It is poor policy for both car maker and tire maker to send out an undertired machine. It is sure to give trouble and particularly in these days of road improvements, when harder road surfaces are coming into vogue and when average speeds along the highways are on the increase. Car owners are already finding that the hard, flinty roads work rapidly on tires by way of making small surface cracks and cuts, which cuts must receive early attention or otherwise the water and dirt entering these openings will soon ruin the fabric.

American vs. European Salesmen Abroad

By John L. Poole, Resident European Export Manager for the Hupp Motor Car Co.

ABOUT the first thing a manager of the American company thinks he must have when he contemplates going abroad into the export trade is a salesman "from abroad," one who can speak at least two or three different languages besides English.

In a number of such cases men were brought over and after 2 or 3 months at the factory returned to Europe to represent an American motor car. In each and every case of this kind, such salesmen have proven a complete failure.

Their ideas of conducting a foreign campaign are by the usual old time European methods; and with a line of American motor cars, success is out of the question. Up-to-date ideas are required over here for American automobiles just as much as at home. Good, wide-awake salesmen are required—men who will work and not sit around cafés and smoke cigarettes all day; men who have confidence in themselves; men with nerve and sand who will not permit any European to "run in a bluff" on them; men who are loyal to their employers, their goods and their country. Such men from Europe for an American motor car company are not be found at any price.

It is not absolutely necessary for the bright American to speak foreign languages, but it would be of great assistance to him to know French and German.

If I wanted a dozen salesmen today I would not engage a single European to represent an American company—not but that they may be all that is necessary for an European maker, they are not suitable to do business and represent an American manufacturer. The American worker is the man—even if he can speak only English. He can do business all around the best men in all Europe for American goods. He has his own way—and it's the good, American way, too. That in itself will gain him an opening and he is always ready to take advantage of such opportunity. He thinks and acts quicker; he has confidence in his ability, and above all, he is a far better judge of his customer.

Furthermore, it is absolutely necessary to have men over here who are able to act at all times, independently, and not be compelled to cable for instructions every time some important matter must be decided quickly. You can not find men in Europe who are capable of acting in this manner very easily. This is due to their business training. They are brought up to be dependent—not independent like our Americans. There is always over here an Over-Director, or Manager, and to him the European salesman must first obtain his consent in everything before he can act, and the Over-Director must obtain the Master's consent and so it goes on and on.

In other words, I claim that the salesman over here is far behind the times—as far as his use to an American firm is concerned. The American salesman on his first trip must be careful. He soon "catches on," however.

Remember—you can't rush things over here. There are no "one-night stands." It is usually a week and sometimes 2 before you find your man. Remember—Rome was not built in a day, and for that matter, no export business either. Don't get discouraged too quickly; study the conditions of each country carefully; get to know your customer on a friendly basis, and above all, do not over-estimate your business. Remember, that nearly all of these men have friends in the United States of America who can give a line on what you are doing at home. Be careful and make no mis-statements. Whatever you promise, fulfill to the very letter. Above all, do no knocking, especially against your American competitors. A case of this kind took place not long ago. A new man from the United States called on a firm in Vienna and on this firm asking the young man if he knew the Hupmobile car and your correspondent, he had little if any good to say, for either the car or its representative. It is not necessary to say who made the deal.

I must add I have never seen the young man, but I know his firm quite well, and I am also glad to say that cases of this kind are rare over here.

My advice I know is old and well known to the good American salesman, but some of them forget when they cross the Pond and get so far away from home and all the things and people to which they are accustomed.

Personally, I am glad to see the boys from home no matter whom they represent. There is room for us all, and I trust that the American makers will send their own countrymen over here when they do decide to take up the export business.

Co-operation of Truck Makers and Buyers

By J. M. Lansden, Second Vice-President of the General Motors Truck Co.

IT is to be regretted that many motor trucks now in operation have been sold to meet the buyer's personal ideas—not his needs. But the shrewd investor in motor vehicles today is beginning to appreciate more and more the wisdom of working with a competent motor truck man to ascertain the type and size of equipment to best meet his requirements.

Foreign buyers believe in this method of purchase to such an extent that certain companies in France and England, known as "transportation engineers" make a business of studying delivery and haulage problems, undertaking to buy and install for clients such equipment as their experience and training teaches them is most efficient for the work in question.

In the past it has been customary for the buyer to tell the truck manufacturer or representative that he wanted a gasoline truck or an electric of such and such a size. If, after the vehicle or vehicles had been placed in operation, the installation did not show sufficient earning on the investment, the buyer was prone to say that motor trucks were unsuccessful in his business or that horses were cheaper. Rarely did he express the belief that the trucks purchased were not properly fitted to his service.

The results of this sort of buying have been in many cases so unsatisfactory that both large institutions and small ones are beginning to take the position that it pays to entertain the recommendations of a reliable company who are not prejudiced for commercial reasons in favor of one type or size of vehicle. At the direct factory branches of many of the truck companies men are stationed who are equipped to advise with prospective installers and co-operate with them in the selection of equipment which represents the utmost in efficiency and economy for their particular needs. And when we stop to consider, this policy is strictly in line with the methods employed by men who are selling many different kinds of commercial units.

The Engineering Digest

Change-Speed Transmission By Compressed Air, with Direct Drive, Likely to Make Devotees of Hydraulic Devices Sit Up and Think—Sigma Again on the Tapis

Fig. 1—The locomotive with automobile motor and variable-speed transmission on the Hautier system, which has been in use in yards of Schneider works in France for one-half year and found very efficient — Radiator and condenser on top of the engine cab — All wheels driven

COMPRESSED-AIR Transmission on the Hautier System.—Since the advent of motor-starters, with the small electric or compressed-air auxiliary power plant which they necessitate, the idea of operating the change-gear mechanism by the same plant, perhaps automatically, has advanced beyond the speculative stage, and it now engages the attention of the research engineers who have in mind the improvements to be incorporated in models for 1915 or 1916. At the same time the problem of producing unabusable gasoline motor trucks, and these, by the way, suitable for being operated with kerosene, benzol or other cheap fuels as well, if needs be, and also special trucks for slow work—whose operation and maintenance must be particularly inexpensive—suggests hydraulic clutches and drives or else electric or compressed-air devices from which it may be possible to bypass a little power when it is wanted for some of the incidental necessities of motor traffic. These two tendencies work hand in hand and are already setting fruit in different inventions, some of them coming from quarters not directly identified with automobile manufacture and perhaps therefore more likely to view the requirements of the immediate future in a free-minded perspective. As examples may be mentioned the Breslauer electric speed-change mechanism of reduced weight (as compared with previous types of gas-electric equipment serving the same purpose) which was recently described in *The Electrician* and the Wells hydraulic clutch described in *Power*.

A remarkable system for power transmission which comes within this class has recently been tried in France in connection with an internal-combustion locomotive built for use in the yards of the Schneider works at Creusot where it has been in service since December 1912. The fuel used for the motor is crude naphtaline for normal operation and benzol or gasoline for starting. The motor develops up to 72 horsepowers, at 1,000 revolutions per minute, and is of the automobile type with thermo-siphon cooling adjusted to allow the water to steam freely, but the radiator which is arched crosswise over the roof of the locomotive returns the condensed steam to the water system, these dispositions assisting in operating the motor so hot that the naphtaline can be melted from the waste heat even if the motor is running very slowly. The locomotive weighs 19 tons and the tractive pull required of it reaches a maximum of 3,500 kilograms, at starts on grades, while the normal pull is about 750 kilograms. The maximum speed is 23 kilometers per hour. It passes daily through a tunnel separating the two portions of the Schneider works which are located respectively at Le Havre and at Harfleur, and it was the necessity for this subterranean passage which suggested a smokeless power system.

The Hautier transmission system admits of varying the torque and speed of the driving wheel axle progressively and continuously and also stores in a special tank, S in Fig. 2, the compressed air by means of which the motor is started. The illustration shows the arrangement of this transmission diagramatically, and the mode of operation is made plain by including the control levers in the chart.

To the shaft O which is turned directly by the prime motor there is keyed the spur-wheel B which meshes with pinions C, these being mounted upon stubshafts extending from the crossbeam E fixed upon the transmission shaft F. A drum H containing these parts is journaled upon both O and F and provided with an internal gear ring (not shown) meshing with pinions C, and a spur-crown I formed externally upon the hub of drum H meshes with pinion I′ which is mounted upon the shaft of a four-cylinder single-acting air-compressor K.

A socalled starting lever D admits of holding the suction valves of this compressor open, when the lever is in the "stop" position, thereby causing the compressor to run idle.

Oppositely to the compressor, with reference to shaft F, there is arranged a four-cylinder compressed-air motor whose shaft carries pinion P in mesh with spur-crown P′ which is keyed on shaft F. The camshaft of the air-motor can be displaced longitudinally by means of lever A, so as to vary the admission and expansion of air in its cylinders.

The discharge ports of the compressor are connected with the admission ports of the air-motor and also with the tank S, the pressure to be reached in the latter being limited by a check-valve T.

When the vehicle is at rest and the prime motor running, the levers D and A are in the positions indicated in Fig. 2. Spur-wheel B tends to rotate pinions C and therefore, by the action of the planetary gear, also the shaft F which at the other end controls the driving wheels of the vehicle, but the rotation cannot be materialized unless the pinions C are resisted by the internal gear teeth in drum H, and, under the condition assumed, this drum presents practically no resistance to rotation, as the valves of the air-compressor are held open; and therefore no force is applied to rotate shaft F and move the locomotive. In order to make the vehicle start it is sufficient to move the lever D to the position "On." The compressor valves are then rendered operative and the work of the compressor creates a resistance to the rotation of drum H while sending at the same time air to motor N. The motor-torque of pinion B is decomposed into two portions, through the intermediation of the planetary gear: The portion acting upon the beam E tends by direct action upon shaft F to advance the vehicle, and the portion taking effect on drum H works according to the adjustment of the compressor.

In proportion as the air pressure is increased—by admitting more air from the compressor to the air-motor—the reaction from the compressor work is transmitted back through the planetary gear so as to increase the torque acting through shaft F, while reducing its speed, and at the same time the air-motor develops a certain torque which is transmitted through pinions P and P′, also to shaft F, reinforcing the turning moment di-

rectly applied to it. Under the influence of these forces the locomotive starts very gradually, tautening the trailer couplings entirely without jerks.

As soon as the vehicle is barely moving, the operator pulls lever A so as to reduce the period for admission of air to the air-motor, thereby increasing the resistance against the functioning of the compressor and reducing its speed. And, through the action of the differential gear (the planetary gear in connection with beam E constituting a differential) this slowing-up of the compressor produces at once a more rapid rotation of shaft F and consequently an acceleration of the vehicle.

On a grade the operator determines readily the position of lever G which is most suitable for utilizing the whole power of the prime motor at any throttle adjustment. On level ground he pushes lever A completely to the left, at which adjustment air-motor N takes no more air and forces the compressor to stop working; this stops drum H from rotating and the transmission between prime motor and driving-shaft is now "direct", the speed reduction being determined only by the ratio of the intervening gears, B, C and H. The power continues, however, to be applied through the interposed air-cushion in the compressor cylinders.

The quadrant for lever A has four notches of which No. 1 corresponds to an air admission of 90 per cent to the air-motor (for starting the vehicle), No. 2 to 30 per cent., No. 3 to 8 per cent. and No. 4 to complete closure (for direct drive).

To stop the vehicle with the motor running it is sufficient to set the throttle on "slow" and lever D on "neutral", while for a prolonged stop of the locomotive the motor is brought to rest by operating lever G. Finally, in order to start the motor again, lever G is pushed back to a position causing the air-motor to be actuated somewhat, and the petcock V is opened, which admits air from tank S to the combustion chambers of the prime motor. The air-motor can be made to function as a compressor for braking purposes, acting like reverse steam in a steam locomotive, by placing lever A in a special notch. The braking effect is in that case graduated by means of a relief cock. The locomotive is, however, also equipped with an air-brake operated with air from tank S.

The reverse is obtained by having at the end of shaft F a bevel pinion in mesh with two idler pinions mounted upon a transverse shaft. A coupling sleeve controlled by lever D' admits of the clutching one or the other of these pinions to this shaft, thereby determining the direction of its rotation. The transverse shaft, in the actual construction of this locomotive, drives another transverse shaft through the gearwheel R, and from this the vehicle wheels are driven by a walking-beam connection. The front and rear wheels are coupled together, so as to get the benefit of the entire weight of the structure for adhesion and traction.

The efficiency of the whole vehicle mechanism, from prime motor to wheel rings, was found at public tests to range from 67 to 93 per cent, according to load, trailer load (maximum 125 tons) and road gradient.

The report of the testing engineers dwells upon the possible applications of the Hautier transmission system to railless transportation and street cars, for which purposes they hold that it offers unusual advantages.—From *Le Génie Civil,* May 31.

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THE Co-efficient Sigma.—The following letter has been received and explains itself:

DEAR SIR:—In your issue of June 5, in noticing my article on "The Coefficient Sigma," which recently appeared in *Internal Combustion Engineering,* you remark that the formula I propose does not disclose in what manner the volumetric efficiency of the motor and the qualities of the carburetor have been set aside and eliminated from consideration.

If you will refer to the article in question, you will note from the equation 1 that the total volume of the cylinders is taken into consideration. Later on, this equation (No. 4) is modified to give the total displacement per ton mile, this being the standard of comparison for the car's performance. In other words, it is assumed that the motor is capable of drawing its full capacity of gas into the cylinders at every revolution, which, of course, is never achieved in practice. That is to say, the volumetric efficiency of the motor is assumed to be one hundred per cent. If the volumetric efficiency of the motor fall off very much, it is obvious that the horsepower will diminish and the use of a lower gear will be necessary. Consequently, the g which appears in the formula takes care of this indirectly.

Again with regard to the carburetor, I have stated that 15 pounds of air per pound of gasoline are required. If the carburetor is imperfectly adjusted to get too rich a mixture, the number of miles per gallon will diminish because more gasoline is consumed. Consequently, the more perfect the carburetion and the greater the number of miles per gallon, the higher will be the value of sigma.

I hope that I have made this matter clear.

H. KERR THOMAS.

June 13, 1913.

The explanation given by Mr. Thomas in the above letter represents exactly the understanding of the matter which the reviewer had arrived at and had aimed to express in his note. It may then be assumed now that the purpose of co-efficient sigma

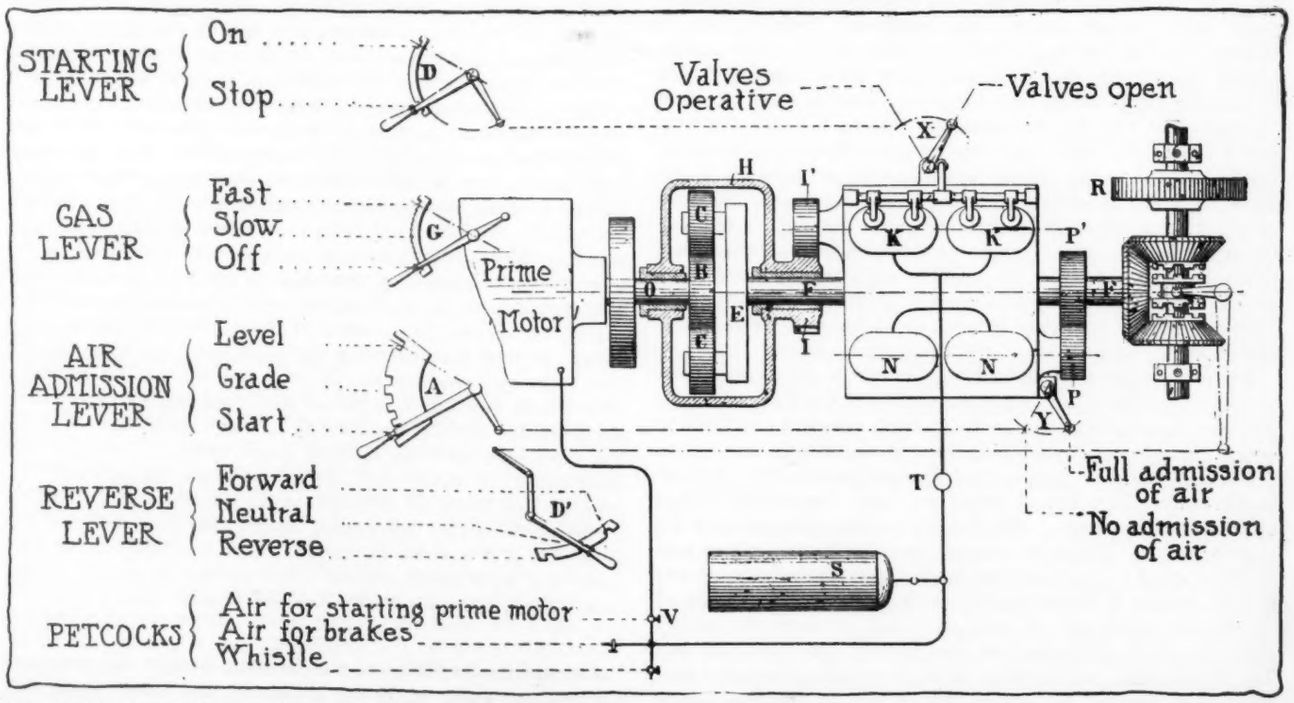

Fig. 2—Diagram of the Hautier system for power transmission at variable speed by means of air pumps, now applied to yard locomotive and suitable for motor trucks and omnibuses of large size

is to present a means for determining whether the fuel efficiency of a car falls short of the highest contemporary standard or not and that volumetric efficiency and the quality or adjustment of the carbureter DO enter indirectly, for their proper share among other factors in determining what value co-efficient sigma shall reach in each case.

The misunderstading must then have consisted in believing that Mr. Thomas had expressed himself to the contrary in his original article, where he wrote about the combination of factors entering into sigma: "This [the combination] not only takes into account the size of the motor and its volumetric efficiency, but also the state of perfection to which the carbureter has been brought." This sentence can be interpreted in diametrically opposite manners, by reason of the use of the indefinite term "takes into account". The tangle of understanding in the realities and misunderstanding of words can scarcely be unravelled now without extensive repetition.

If, however, the day should come when manufacturers would announce the co-efficient "K" and the co-efficient sigma of their cars, as they now announce their horsepowers on the basis of either formula or test or both, it would become important indeed to know that a low sigma—meaning a high fuel consumption—might be charged up against the carbureter, the size of the valves or the shape of the combustion chamber just as well as against sluggish wheel bearings, inaccurate gears and other sources of mechanical friction. A movement to popularize "K" and sigma in public announcements would, for that matter, be a very pleasing innovation and might perhaps lead to interesting results in the way of setting up rivalries of a new sort not only between manufacturers but also between car owners. The horsepower formula is widely understood; why not "K" and sigma? They are no more intricate to a veteran motorist than the tax-horsepower formulas of France or Germany are to a tyro.

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INDUSTRIAL Applications of the Spray Method for Producing Metallic Coatings.—A number of corporations have recently been formed in Europe to exploit the Schoop metallizing process, from which fast of record it may be inferred that certain advantages of this method have been demonstrated, but it is not yet clear whether these advantages are the same as those which should interest the automobile industry. It is claimed (1) that the spray method is much cheaper than electroplating mainly because it is far more expeditious, (2) that the coating produced by it is firm and workable in any desired thickness and (3) that an aluminum coating is as readily produced as one of copper, zinc, lead or tin. These are among the results of the process which would appeal to automobile and accessory manufacturers if thoroughly substantiated. The possibility of cheapening and lightening motor castings by spraying the water-jackets into a paper form, afterwards cementing the joints likewise, and that of building radiators by spraying a strong and conductive metal upon a thin stamping of easily fusible material, representing what is going to be the hollow spaces and to be melted out, are attractive in theory.

The information relating to the whole process which was given at a lecture delivered in Berlin recently by a Dr. Lach may contribute to a sound estimate of the probable practical probabilities, and is reproduced in condensed form in the following:

The first patented spray method for metals dates back 30 years in Germany. Superheated steam was used for siphoning and atomizing molten-metal. The Schoop method was begun on the same principle. The main progress was that heated gas as well as steam could be used and that much higher pressures were employed, causing a firmer coating to be produced. A portion of the gas or steam current was also used to force the molten metal by direct pressure into the path of the main current. The second stage was reached when it became understood that rapid expansion of the strong gas current in the atmosphere cooled the molten metal so effectively that it really was no longer in a liquid state when striking the surface to be coated, and that finely powdered metal therefore could be used just as well as molten metal. The melting of the metal could thus be dispensed with, which meant an important simplification of the apparatus. The third stage is technically and practically the most interesting, though it consists in abandoning the pulverizing of the metal and returning to a melting process, but this time an instantaneous one taking effect only the moment the metal is wanted and in proportion to the requirements of the work. The improvement was borrowed from the oxy-acetylene welding and metal-cutting practice developed independently in the meanwhile.

Glass and metal of high fusion point can after this last improvement be handled with almost the same facility as the baser metals. The apparatus now consists of three concentric tubes spaced apart. The inner one contains a wire, of the metal to be sprayed, which can be fed out gradually, and the other tubes serve as conduits for hydrogen and oxygen, respectively, both under high pressure, so that they flow out with great velocity. They are lighted, and the flame so formed melts the end of the metal wire which projects from the inner tube, atomizes this material and projects it with great force. If the heat of the oxy-hydrogen flame is insufficient, an oxy-acetylene flame can be produced instead, or an electric arc can be used by first melting the metal in it and allowing the drops to fall into the path of the gas current close to the nozzle. In practice the feeding of the wire to the flame is accomplished by actuating a small air-turbine by the gas, and the turbine then pushes the wire forward in proportion to the capacity of the flame for melting it, since the speed of the turbine and the heat of the flame both depend upon the gas pressure.

Whether the metal is blown upon porous material such as wood or paper or against a metallic surface, it is found that it enters in a very close union with the receiving surface, even to the extent of forming a metallic alloy in the contact zone. According to the nature and the preparation of the surface the coating can be made adherent and permanent or removable. The thickness can be varied, according to the duration of the exposure, from a few thousandths of a millimeter to 10 millimeters. Among the industrial applications of the process it may be mentioned that it has been found possible to produce a porous lead coating for storage battery plates. For the galvanizing of finished structures, such as bridges, and for objects with sharp corners where ordinary galvanizing does not adhere or get too thin, the advantages are obvious, the process taking the placing of painting in many instances by virtue of the hardness and permanence of the coating.

The electroplating work which can be done in one hour by the electric current the spray method can duplicate in one minute and without raising any question of the materials. Especially, coatings of aluminum which it has been found very difficult to precipitate by electroplating can be handled with precision and lasting results. Celluloid and balloon cloth can be metallized. The wood in ships can be protected against decay and insects. Explosives can be sealed up hermetically, which is of considerable importance, in the case of modern smokeless powders and other explosives, for the preservation of their properties and to avoid danger in their transportation on shipboard. Through the fact that removable coatings can be produced, the process attains a considerable importance in the art industries and for reproducing phonographic records, electrotypes for the manufacture of seamless tubes—the latter by spraying paper tubes with steel or any other metal of which it is desired to make the product. By twisting two wires of different metals together or by sending the spray from two apparatuses against the same object at the same time it is possible to produce alloys for experimental purposes in a very handy manner which admits of accurate variations.—From *Dingler's Polytechnisches Journal*, June 7.

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Automobile Statistics of the German Empire are presented in *Der Motorwagen* of May 31 giving the distribution of the different classes of vehicles in all of the states and provinces for the years 1907 to 1913 inclusively.

The Engineers' Forum

Defects in Springs

Part II

Emphasizes Shortening of Tire Life by Imperfect Spring Suspension

SEVERAL more interesting communications have been received on the subject of Defects in Springs, the discussion of which was opened by the comments of several engineers on the article by G. H. Baillee in THE AUTOMOBILE for May 29. Most of these communications, however, are too long to permit of publishing them this week. They will appear in the Forum in succeeding issues.

Good Springing Saves Tires.—Sturgis.

OAKLAND, CAL.—Editor THE AUTOMOBILE—We have read with much interest in your issue of AUTOMOBILE for May 29, the article on Defects in Springs.

The writer has personally been on the tire end of the game for about 10 years and during this time has seen a few changes in tires, but have not noticed any radical changes in the springs other than the difference in the metals used and less breakages at present than in the early stages.

As it is to-day the pneumatic tire has to absorb by far the largest of the shocks, and consequently the life of tire is comparatively short. It has come under my personal observation a number of times that cars with the stiffest springs are those that the tires wear out rapidly on, and necessarily, of course, give the greatest amount of trouble.

The tire man would welcome more flexible springs or pneumatic suspension of the chassis. As it is to-day, the tire man has his troubles, and plenty of them.—V. K. STURGIS, Pacific Leather Works.

Why Not Hold Accessibility Contests?—Duryea.

SAGINAW, MICH.—Editor THE AUTOMOBILE—I have read the remarks of Lee Day in the Engineers' Forum, regarding accessibility and demountability, with much interest. I second his attitude strongly. It does seem odd that the public pays so little attention to such vital features. The only explanation that seems to be in sight is that the makers dare not submit their cars to tests of accessibility. They make a big talk about reliability, and more or less about accessibility, but an accessibility contest has not been held so far as we know. It is a well-known fact that the factory cost of a repair part is generally very small, but the cost of getting it into the vehicle is a very expensive item. The public in time learns this, but has no real method of knowing whether the next rig it buys is any better or not, and so long as attention is not given to these points neither the public nor the makers do much toward making them better. There is a big hullabaloo about many details of no particular importance, but this one of accessibility for purposes of attention and repair is sadly neglected.

There are enough experienced users of automobiles in the world to-day to make an accessibility contest a very interesting affair. These experienced men know something about the troubles of adjusting and repairing, or replacing any given part, and if our various exhibitions or contests should include one or more accessibility trials, the good to the industry would be immense and immediate. It would accentuate for the maker a valuable feature, and it would certainly please the user. Each contestant should be allowed to furnish his supply of tools, but they should be listed, and their weight, bulk and selling price stated. The vehicle should be driven and inspected so as to know that it is in running shape, all parts being present. Then in the presence of the spectators, and previously unknown to the contestants, a certain repair stunt should be required. That is to say, remove the power plant, or remove the piston, or any other vital part that in actual practice may require removal. The time required to accomplish this should be taken, and also the time required to replace it. Then the car should be again driven and inspected.

The maker does not see this thing from the user's standpoint. He is prepared with appliances for lifting off the body or separating certain parts of the car, that the user does not have, and to his skilled men a job that may be inherently difficult does not strike them as being such, but when this work must be done away from the factory with few appliances, and generally with but one or two men, the problem becomes entirely different. A task that was not disagreeable on a brand new machine, perfectly clean, and with every appliance, becomes a very disagreeable problem when performed as the user performs it on a dirty machine, and without the necessary tools, as often must be done.

While suggesting contests, I would like to further suggest coasting contests. In these days of high-priced fuel everybody should be interested in economical running, and the car that runs most easily is the car that requires the least fuel. Of course different size cars should require different quantities of fuel, and therefore the best test available is the one which will select the most easy running car in proportion to its weight. This a coasting contests shows at once. If every user could select a hill on which he can frequently test his car as to its coasting ability, he could always know whether it was running with its accustomed freedom or not, and therefore know whether he was burning more fuel than he should, or not. A dragging brake band is responsible for much engine trouble, and a coast over a known surface will show whether or not the brakes are as free as formerly. The same thought applies to bearings that may not be properly oiled, or that may be badly worn, to tires that are not properly inflated, and many other points. The coasting contest has the elements of a contest in it, and the public like to see one rig surpass another, so it could be made an interesting thing, possibly in conjunction with a hill climbing contest. For actual test purposes, however, some sort of towing test would serve the same purpose. Every owner should know how many pounds are required to tow his car on a floor or level road, and by occasional testing he could know its running condition. It is a sad commentary of our modern automobiles when three or four men are required to push one about in a garage, as is frequently seen to be the case. It should be evident to anyone that if this much power is necessary, the unfortunate engine must use much fuel in order to overcome a lot of needless resistance.—CHAS E. DURYEA, President Duryea Motor Co.

Keeping Track of Tires

Sales Records and Other Forms Help Dealers To Keep a Record of Cost, Use and Other Items

TIRE manufacturers have devised special cost-keeping systems for their dealers, not only in the matter of repair work, if such is done by the dealer or a factory branch—which, however, is a rare state of affairs—but also for making exact records of all sales of tires. To avoid all misunderstandings from the beginning, let it be said here that this is not done to record the owners of a casing number so and so, but merely in order to keep up-to-the-minute statements of the companies' business on hand and to keep the factory posted on how the sales organization is progressing, thereby giving it a direct opportunity of gauging the future requirements of a certain territory.

A number of the sales record forms used by the New York representatives of some very prominent tire makers are here shown, these being the Goodyear, Firestone and Michelin concerns. The sales record Fig. 1, of the Goodyear Tire & Rubber Co., 10.5 by 6.5 inches, is filled out by the salesman closing a tire sale, and two carbon copies are made at the same time with the original record. The original is light blue, the duplicate yellow and the triplicate pink. All three copies bear the same number, each set of three forming part of a series of consecutively numbered blank sets.

In making out this record, the salesman fills out the names and addresses of the parties ordering and receiving the goods, the terms on which they are sold, his name and the class of the customer, that is, consumer, dealer or special dealer. This having been done, the three copies of the order are sent to the stockroom, where the foreman sees that they are properly filled, after which goods and order proceed to the shipping department, the person who took the goods from stock having signed the order under "Assembled By." The shipping clerk also signs the order and notes on it the number of the invoice and the bill of lading or receipt obtained when the goods were sent out.

Then the set of three copies is sent to the office of the manager, where the blue original is filed with preceding originals, in numerical order, while the yellow copy is filed in a folder marked with the buyer's name, all folders being arranged alphabetically. Thus a cross indexing scheme is operative between originals and duplicate orders and it is easy to get at one or the other, provided the name of a customer or the number of the order is known.

The pink triplicate, which is only 7.5 by 6.5 inches, is sent to the Akron factory. On its reverse side are spaces to be filled out if the order is filled by and by, these spaces being for the date of the shipment, the invoice number, quantity, size and weight of the goods and the name, that is, casing, tube, inner liner or what else it be.

A different form serving the same purpose is used by the Michelin Tire Co., Fig. 7. This form is 11 by 7 inches and is made out in four copies: White, original; yellow, duplicate; red triplicate, and white, quadruplicate. The use of these blanks is peculiar, due to the fact that all large shipments are made not from New York but from the Milltown, N. J., factory, and that the blanks are used not only in case of sales made at the branch and filled there, but also when orders are to be filled from the factory or goods are to be shipped to the Metropolitan branch. In this case, the original is sent to Milltown, without any prices marked on it, while the duplicate, upon which prices appear, remains in the book of the branch. The triplicate, destined to be given to the customer when the order is taken, is not used but destroyed when the branch orders stock from the factory. The fourth copy is sent to Milltown with prices marked on it. The factory files the unpriced records in order of the

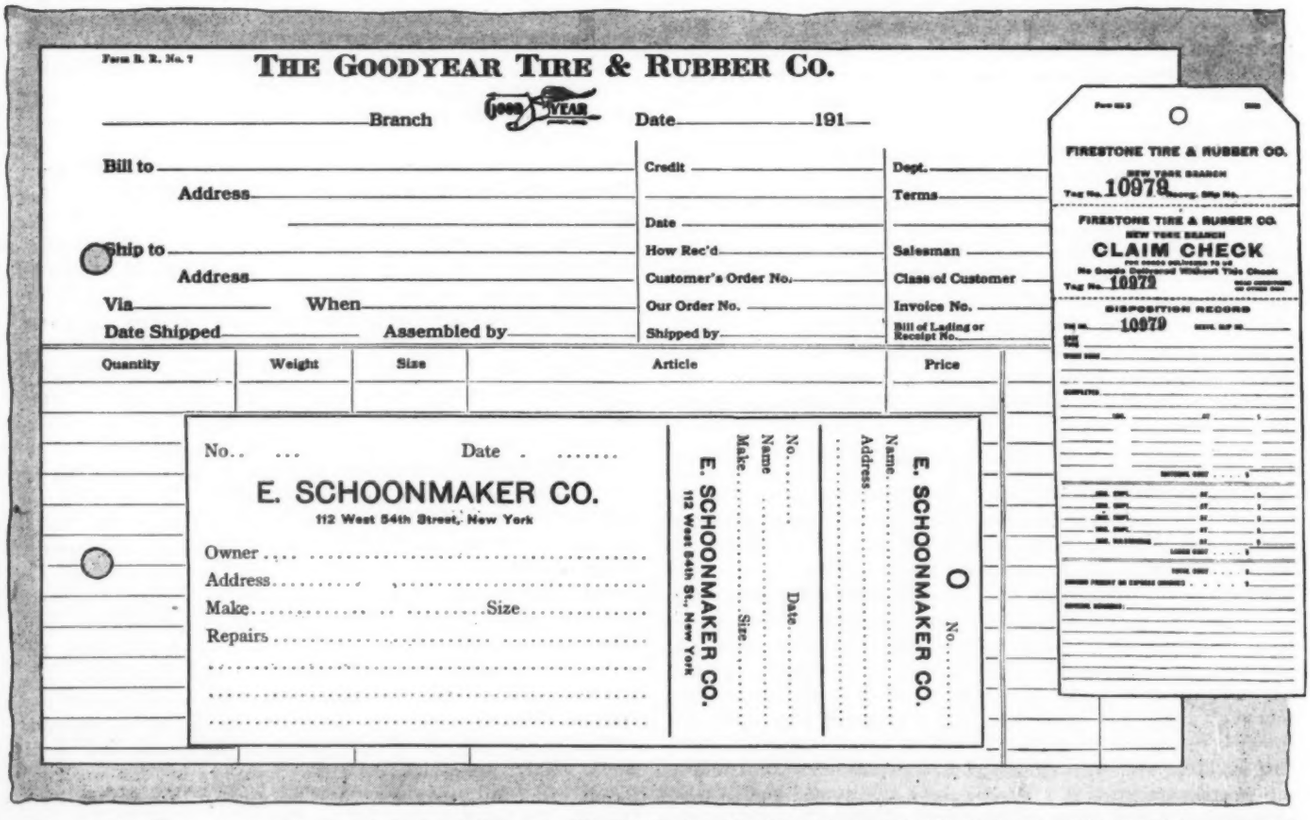


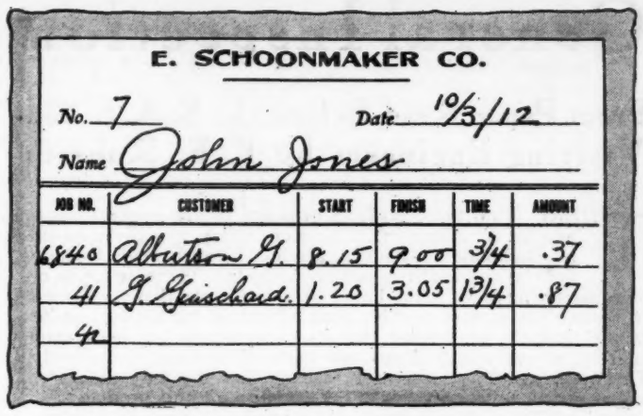
Fig. 1—Sales form of the Goodyear Tire and Rubber Co. Fig. 2—Work order, claim check and adjuster's slip of the E. Schoonmaker Co. Fig. 3—Adjustment form of the Firestone Tire and Rubber Co.

dates and the priced ones according to names of the customers.

When a sale is made and filled at the branch the stock clerk retains the first copy as a receipt for the goods issued, the priced duplicate remains in the book in the office, the triplicate is priced and delivered or mailed to the customer and the quadruplicate is returned by the shipper to the branch billing department.

The Firestone Tire & Rubber Co.'s form is shown in Fig. 8. It is 8.5 by 11 inches, and is issued in triplicate, being numbered. The yellow original, when all spaces have been duly filled in, is filed under the customer's name, in the same way as in the case of the Goodyear system; the white duplicate is filed under the number and the triplicate, printed on thin cardboard is packed with the goods at the time of shipping.

The repair room systems vary with the companies using them. It must be said in this connection that the majority of companies represented in New York City have no repair departments, but send all repair work to be done to reliable outside shops and charge the customer with cost. Among the few exceptions which have their own repair shops, is the Firestone concern. Fig. 3 shows the form used by this company in handling its adjustments. The form consists of a tag composed of three sections and 3.3 by 8.5 inches in size. All three sections are stamped with the same number. The top section serves as receiving slip, filled out by the adjuster with a serial number when the tube or casing is received for repair. On the bottom section the work to be done is named with all the necessary detail, and space is provided for recording the work spent on the repair job. The middle section or so-called claim check is given to the customer bringing in the tire and it is taken from him in exchange for the repaired product when the latter is delivered to the owner. The receiving slip is filed away by the adjuster under the customer's name as soon as the repair has been completed. When the tire had been delivered, both work order (bottom section) and claim check, which are fastened together, are filed away under the customer's name.



E. SCHOONMAKER CO.

No. 7 Date 10/3/12

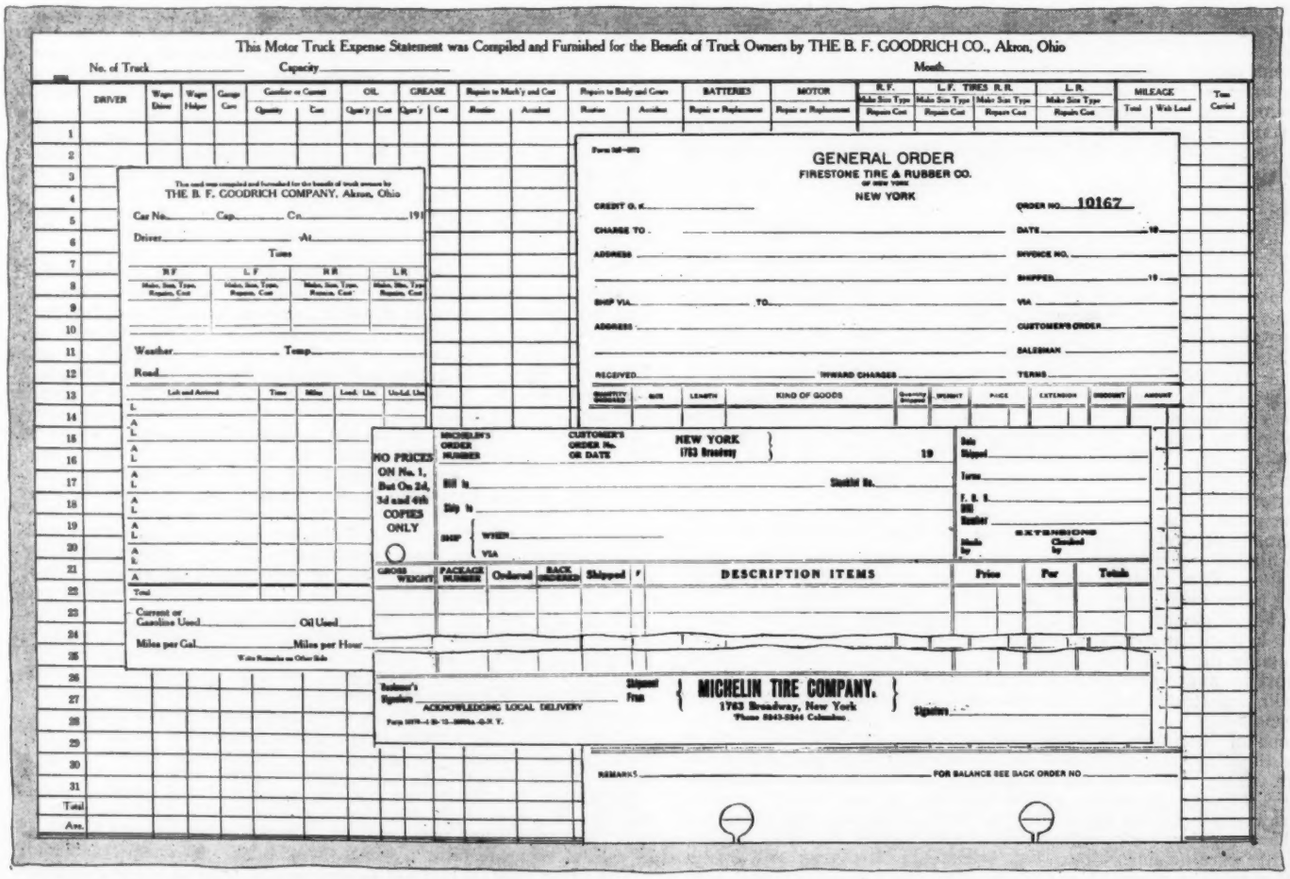
Name John Jones

JOB NO.	CUSTOMER	START	FINISH	TIME	AMOUNT
6840	Albertson G.	8.15	9 00	3/4	.37
41	G. Guischard.	1.20	3.05	1 3/4	.87
42					

Fig. 4—Workman's time distribution card used by the E. Schoonmaker Co.

As the example of a large company doing contract repair work for big tire dealers in the Metropolis, the E. Schoonmaker Co. may be mentioned here. Its system uses three forms, a time distribution record, a materials-used record and a card serving the same purpose as the Firestone card just described. Fig. 4 shows the time-distribution record used daily by each workman. On the form he enters the number of the repair job, the name

(*Continued on page* 1311)



This Motor Truck Expense Statement was Compiled and Furnished for the Benefit of Truck Owners by THE B. F. GOODRICH CO., Akron, Ohio

No. of Truck ____ Capacity ____ Month ____

	DRIVER	Wages Driver	Wages Helper	Garage Cost	Gasoline or Current: Quantity	Cost	OIL: Quan'y	Cost	GREASE: Quan'y	Cost	Repairs to Mach'y and Cost: Routine	Accident	Repairs to Body and Gears: Routine	Accident	BATTERIES: Repair or Replacement	MOTOR: Repair or Replacement	R.F.: Make Size Type / Repairs Cost	L.F. TIRES R.R.: Make Size Type / Repairs Cost	L.R.: Make Size Type / Repairs Cost	MILEAGE: Total	With Load	Tons Carried
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THE B. F. GOODRICH COMPANY, Akron, Ohio

Car No. ____ Cap. ____ Co. ____ 191

Driver ____ At ____

Tires

R.F.	L.F.	R.R.	L.R.
Make, Size, Type, Repairs, Cost	Make, Size, Type, Repairs, Cost	Make, Size, Type, Repairs, Cost	Make, Size, Type, Repairs, Cost

Weather ____ Temp. ____

Road ____

Left and Arrived	Time	Miles	Load. Lbs.	Unload. Lbs.
L				
A L				
A L				
A L				
A L				
A L				
A L				
A				
Total				

Current or Gasoline Used ____ Oil Used ____

Miles per Gal. ____ Miles per Hour ____

Write Remarks on Other Side

GENERAL ORDER

FIRESTONE TIRE & RUBBER CO.

NEW YORK

CREDIT O. K. ____ ORDER NO. 10167

CHARGE TO ____ DATE ____ 19

ADDRESS ____ INVOICE NO. ____

SHIPPED ____ 19

SHIP VIA ____ TO ____ VIA ____

ADDRESS ____ CUSTOMER'S ORDER ____

SALESMAN ____

RECEIVED ____ INWARD CHARGES ____ TERMS ____

QUANTITY ORDERED	SIZE	LENGTH	KIND OF GOODS	Quantity Shipped	WEIGHT	PRICE	EXTENSION	DISCOUNT	AMOUNT

NO PRICES ON No. 1, But On 2d, 3d and 4th COPIES ONLY

MICHELIN'S ORDER NUMBER ____ CUSTOMER'S ORDER No. OR DATE ____ NEW YORK 1763 Broadway 19

Bill to ____ Stock No. ____

Ship to ____

SHIP { WHEN ____ VIA ____

Date Shipped ____ Terms ____ F. O. B. ____ Route ____ EXTENSIONS Checked by ____ Made by ____

GROSS WEIGHT	PACKAGE NUMBER	Ordered	BACK ORDERED	Shipped	DESCRIPTION ITEMS	Price	Per	Totals

Receiver's Signature ____ ACKNOWLEDGING LOCAL DELIVERY

Shipment From { MICHELIN TIRE COMPANY. 1763 Broadway, New York Phone 8943-8944 Columbus

Signature ____

REMARKS ____ FOR BALANCE SEE BACK ORDER NO ____

Fig. 5—Goodrich record system for owners to be used on trucks equipped with Goodrich tires. Fig. 6—Driver's daily report card used in the Goodrich cost-keeping system. Fig. 7—Sales form used by the Michelin Tire Co. Fig. 8—Corresponding form employed by the Firestone Tire and Rubber Co.

General Inspection

From Paper Read Before the S. A. E. and Visiting Engineers by E. F. Roberts

THERE is no more positive evidence of the general desire among American manufacturers today to deliver to the buying public a dependable product, honestly made, than the general interest in inspection methods. There should be no more satisfying proof to the buyer of a motor car that the vehicle represents the utmost possible limit of safety for himself or his family than the knowledge that its construction has been safeguarded at every step, from raw material to finished assembly. The progressive manufacturer realizes that the only assurance of permanent prosperity lies in the excellence of his product; and eternal vigilance is the price of excellence. Inspection, close, constant and rigid, is thus imperative to maintain the quality in the product and, although when adequately inforced, one of the most costly features of a motor car organization, it must be recognized as one of the most vital. Realizing structural strains at the average speed of a powerful car and the gravity of possible flaws or breakage, it is obvious that to the purchaser the most essential consideration is the certainty that every detail of material and construction has been subjected to the most severe and searching test that skill can devise for his protection. Absolute interchangeability of parts is also an essential for rapid and economical production and modern inspection with quick-acting gauge systems constitute the indispensable factor of attaining this result.

In large industries, perhaps the first feature that should be considered in an inspection system is the relation of its personnel to the rest of the organization. To secure the determined and inflexible adherence to the standards of quality and workmanship laid down by the management, members of the inspection department cannot be in any degree subject to the control of any shop foreman or any executive directly producing. Evidence to this effect is so common to the experience of all factory executives that the principle scarcely needs mention, but its expression is justified by the fact that in spite of this, scores of organizations either through ignorance of their own situation or indifference permit such conditions to remain. It is an emphatic axiom that the average workman thinks of his job first and duty afterward; and an inspector refusing to pass defective work for a foreman who can discharge him is, commercially, an imaginary quantity.

Six Divisions

For convenience of administration the Packard plant is organized into six productive divisions designated as Chassis, Body, Truck, Forge, Foundry and Service Divisions. Each division constitutes a unit in itself, not only as regards productive organization, but also as concerns its inspection force. Each division's inspection corps is in charge of a general head and over all the divisions extends the authority of the chief inspector. This executive is responsible directly to the general superintendent, is personally a thorough and experienced mechanic, familiar with general engineering practice, standards and limits, and also an expert as regards manufacturing conditions, gauge systems, tool design, etc. With his assistant and through the division heads and foremen inspectors in charge of buildings and, in some cases, large departments, he is in direct control of every inspector in the plant. Foremen inspectors may to a limited extent perform actual inspection work, but their duty is essentially that of maintaining the efficiency of the men and methods under their supervision. They must be actively watchful of the care used in checking parts, must see that all parts brought up are handled promptly and that gauges and instruments are properly used, and, above all, kept continuously in first-class condition. Through their personality the policy and standards of the entire inspection system must be impressed upon every individual in it and the quality of their department output is a standard for which they are directly responsible. Regular department foremen may report infractions of discipline by inspectors and have prompt action taken by the chief inspector, but individual inspectors in departments are wholly free from any constraint in criticizing poor workmanship. Every operation and every part is passed or rejected absolutely upon its conformity, or lack of it, with the blueprint. There are large placards conspicuously posted in every department warning inspectors that immediate discharge will result from passing work on any other basis, except written authority of a general executive. Every possible means is thus employed to impress upon the inspectors that their sole responsibility is the maintenance of quality, and that their positions depend upon this and nothing else. An inspecting force, although necessarily recruited from various sources, should consist mainly of men of previous experience and training in other mechanical departments of the plant. All inspectors should further, when first assigned to this duty, be placed in company with an experienced man and their work carefully watched for a number of days before giving them individual assignments. Special care should be exercised in selecting and examining them, they should be well paid and every possible effort made to hold satisfactory men permanently on the line of work in which they have become expert. A graphic organization chart is herewith given to indicate the relations of the various branches of the Inspection Department.

Limits

The function of an efficient inspection department should begin even before the drawings are approved in the engineering department. The chief inspector should be *ex officio* chairman of the limit committee, whose duty it should be to pass on all drawings to determine whether the limits assigned by the designer are commercially practicable, thus ensuring the elimination of many possible sources of later friction and delay. After the drawings for a new design are approved and signed by the limit committee, and not until then, they should be issued to the various functional divisions, the set in which the inspection department are interested being those sent to the tool room. These, of course, should be checked over to determine the new tools and fixtures required—and also on the inspection department's behalf—to determine the new gauges necessary, preparation thus being under way for the inspection of the finished product, in some instances, even before the raw material is ordered.

Material

Material, as will be noted from the chart, should be for inspection purposes divided into raw stores, including bar, tubing and sheet metal; car parts rough, comprising castings, stampings and forgings; body parts rough, such as lumber, leather, glass, trimming fabrics; and car parts finished and semi-finished. To insure uniformity of composition and quality all metals should be bought on the basis of standard analytical specifications, developed by the engineering department through laboratory test and research. Supply firms, before making up an order, should send in sample test pieces for approval, insuring in this way almost invariable conformity with the specifications and eliminating delays and arguments. In the case of ordinary bar stock, as soon as a consignment is received and checked in as per invoice, it should be inspected for size, limit snap gauges being used and each end of each bar being checked. Straightness also should be noted, as occasionally a bar may be found that would not pass readily through the machine collets. A bar should then be selected at random and a test piece 3 or 4 inches long sawed off. This should be tagged with the date, amount of consignment, grade of metal and the purpose used for, and forwarded to the laboratory for analysis.

The laboratory is exceptionally complete and well equipped for analytical and physical research. It is in charge of a chemist and engineering specialist of wide experience; and every imaginable determination required in industrial engineering can be covered in this department from the crystalline structure of the antimony content in crankshaft bearings to the tons of pressure required for the breakage test of a front axle. Special rush service can always be had from a laboratory of this description in 12 hours, although ordinarily 2 days are allowed. As soon as the test piece has been removed, each bar should then have the grade number and date stamped on the end and the consignment should be placed in the regular rack pending receipt of the laboratory release. After analysis the duplicate stub from the specification tag will be removed by the laboratory and returned to the stock department, thereby either releasing the consignment for factory use or rejecting it as unfit. If the analysis is satisfactory, the stockkeeper should then paint the ends of all bars in this lot with the standard color for that grade, indicating its readiness for use. To ensure this method being given proper attention, personal instructions must be issued, and as a further precaution, signs be posted warning the men that painted ends must never be cut off and that all bars must be placed in the racks, painted ends out. If the laboratory analysis shows the sample below grade limits, the stock department should notify the purchasing department and arrangements should at once be made either for the return of the consignment or is substitution for any other use for which it may still be fit. Bar stock intended for special use, such as piston pins, universal joint pins, etc., or selected stock, should be kept in special separate bins.

The same general method should be followed in the inspection of tubing except that it must be checked for inside diameter or thickness of wall, as well as outside diameter, and also for eccentricity. Standard sheet metal, aluminum, brass, copper,

steel galvanized sheets, etc., from established firms need ordinarily be checked only for gauge and general appearance and accepted without analytical test. In the case of stamping stock, however, a test strip 1.5 by 12 inches should always be submitted for analysis and tensile test. In such instances the same procedure would be gone through with as in the case of bar stock, except that a different method of marking (surface stamping) must be used.

For ensuring the correctness of forgings the regular practice should be to submit a lead proof for a preliminary check before the dies are hardened. The lead as soon as received should be delivered to the purchasing department for record and forwarded by them to the engineering department for general checking as to design specifications. If satisfactory it should then be transmitted to the tool department, where it must be laid out and carefully gone over in detail with the drawing, and this opportunity should also be improved for comparing it with the design of any fixtures and gauges relating to this part. As soon as this check is completed the tool room inspector should immediately advise the purchasing department as to approval or rejection. If approved, as soon as delivery of forgings begins, a few of the first may be selected at random and again checked over in every detail to cover any possible deviation on the dies or negligence on the part of the operator. Important parts subjected to heavy stresses, such as axles, steering levers, steering knuckles, steering worm, transmission gears and parts, should invariably pass the analytical test for every consignment also before being released.

Checking of Patterns

Patterns for castings should in every instance be closely checked by a special inspector before being released for use, thus eliminating chance of error as much as possible, in the initial state. As soon as the first casting from any pattern is completed it should be at once forwarded as a test sample and submitted to the same inspection and detail checking as that given forgings and the same routine may be followed in rejecting or accepting it and approving delivery. In the foundry test bars are run from every melt and regularly analyzed and tested for physical properties. Individual castings are inspected in detail as received, although not laid out for every operation. In general casting inspection cored holes and bosses should, however, be checked to discover any possible variations due to core shift and the entire casting should also be carefully scrutinized for sand or blow-holes. Doubtful places must be tapped with a hammer, or, to determine leakage, tested with gasoline. The scleroscope test may also be employed in case trouble is experienced on account of excessive hardness. Stampings should be covered by an initial inspection practically the same as that given forgings, except as regards tool work, since they are usually a finished product when received, requiring ordinarily only a polishing, enameling or similar operation. Such exceptions as do require machining to any extent must be given the same thorough checking and testing that the forgings are subjected to.

Body stock should be also inspected, the lumber being scaled and examined for quality and soundness, while leather, cloth, glass, etc., should each be checked over by experts in these lines. Paints, oils and varnishes should be bought both on analytical and weathering tests and a year's exposure to sun, wind, rain and sleet is none too strenuous a test for body varnish. The passing of all finished parts, from miscellaneous supplies and tools to occasional car parts bought finished, should also be within the jurisdiction of the inspection department and conducted with the same unvarying fidelity to standard quality and specifications as observed in regard to all other items. The essential features of an efficient material inspection are, first, that nothing must be left to the individual judgment or opinion of the inspector. Every specification should be based on the most thorough engineering or mechanical research and embodied in drawings or written instructions. The second and equally important consideration is that the inspectors must absolutely be under no constraint as regards considerations of production. However badly the factory may need material or parts, the receiving inspector must recede in not the slightest degree from his standards. He is paid and must be held responsible for the maintenance of quality alone. Production to him should be a matter of absolute indifference.

The foregoing methods and regulations for the inspection, analysis or test of all stock and parts entering a plant are intended to and, we believe, do guarantee the quality and fitness of every item of material comprised in the car. Perfect material is, above all else, the requisite of first importance. Poor workmanship may spoil good material, but no amount of good workmanship can ever redeem poor material.

Factory inspection of parts in process in a large organization can be best conducted almost entirely on a departmental basis. In a small plant a central inspection department possesses certain advantages, but with the growth of any business, the time required for trucking and handling must eventually make this method obsolete. In each department a central location should be selected, well-lighted and convenient, and here at inspection plates should be installed the head inspector and his assistants. The inspection plates used in the Parkard factory are of cast iron, 24 by 57 inches, and of massive and rigid construction. They are planed and finished on top to an accurate surface and carefully used and looked after, being covered every night with a coating of oil and frequently tested for trueness. At these sit the inspectors, provided with blueprints covering every part handled in the room and with standard or special gauges for checking every operation; and to them are brought all the various lots of parts as fast as completed in each operation.

Gauges

The greatest factor in quick and thorough inspection is an efficient system of gauges. There is no more common fallacy in manufacturing than the assumption that a correct set of gauges once issued insures accuracy of workmanship. And a pretty general fallacy is the assumption of correctness for the gauges themselves. Ordinarily the micrometer is accepted as the standard of measurement. When, however, it is remembered that the average micrometer will alter merely by the heat of the hand to an extent of two ten-thousandths, it is obvious that the court of final appeal for accuracy must be a higher one. There can be no more absolute precision standard than the Johannson system of gauges. A set of these gauges consist of eighty-one blocks, increasing in size by graduations of one ten-thousandth of an inch. They are manufactured in Sweden, the completion of a single set requiring about five years and the surfaces when finished being so perfect that atmospheric pressure will hold a dozen of them suspended in a cluster from one held between the fingers in the same manner as though magnetized. In addition to their almost infinite accuracy they are so impervious to variations of temperature that one of them may be carefully checked in a warm room with the most sensitive instrument possible and then after being laid on ice again checked without showing the slightest variation. These gauges may be accepted as the final source of authority on the accuracy of all manufacturing dimensions. They should serve as the check for all master gauges, which in turn check the shop sets. Special gauges, of course, must be designed in the tool draughting room as soon as the original design of a new model is issued. Standard gauges, however, are required in such large quantities and the efficiency of any inspection system is so dependent upon their immediate accessibility that standard blanks for snap, plug and ring gauges should be carried in stock at all times. These may be made up rapidly and at low cost principally on automatics, leaving only sizing and finishing operations for the toolmaker. This method renders gauge equipment so readily accessible that there is no incentive or excuse for negligence in this respect. All rough stock sent into the factory in dimension lengths should be cut to gauge in the stockroom. The workman who machines it should have a gauge for his operation which is a duplicate of the inspector's. The inspector's gauge is thus a check on the accuracy of the workman's, and all the inspector's gauges should be in turn checked at regular intervals with the master gauges held in the tool room. Too much emphasis cannot be placed upon the importance of properly checking and caring for the master gauges. The set should be at

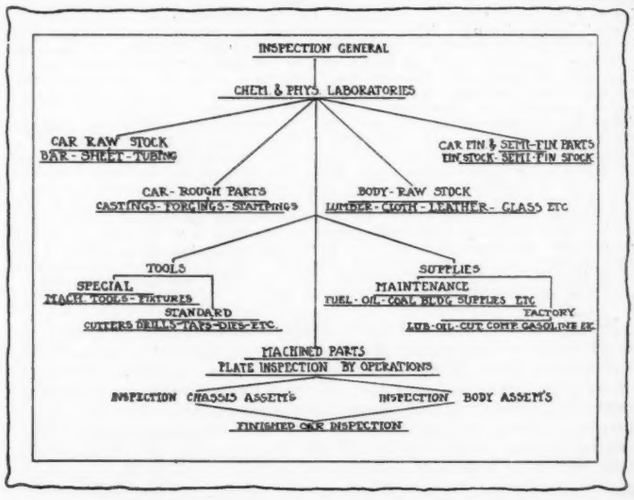


Diagram illustrating the general scheme of inspection

least sufficiently complete to cover every important part. They should be given not less than three different checks with the Swedish master blocks by three different inspectors and these separate readings reconciled before being approved for use in the first place. They should be kept in vaults under lock and withdrawn only on fixed occasions or by some executive's order and then only by the man or men regularly assigned to the duty of handling them. No attempt should be made to use them indiscriminately for checking shop gauges, as their function should be the control of the inspectors' gauges only. Every gauge in every department should be turned into the tool-crib at the close of working hours. Some of the more important ones must be checked daily before issue and very few should be permitted to be used unchecked for more than a week. Limit thread gauges in particular must be checked with the master gauges every few days for accuracy of dimensions and depth of thread.

Gauges Must Be Sized

All gauges must be sized to the limits shown on the print and only parts coming inside these limits passed. Parts outside the limit, except where the defect is a nominal one only, such as oversize, may be sent at once to a central checking station. All parts received here should be examined daily by the chief inspector or his assistant and the division superintendent or his assistant. The reason for the defect should be clearly determined and if tools are at fault the proper correction at once made. If, as is usually the case, the cause is negligence on the part of the operator, the foreman's attention must be called to it and both he and the operator warned against a repetition. In the department itself, the inspectors, as soon as a defective lot of parts appears, should issue to the foreman a written "stop-notice" or warning that a certain operator or certain machine is producing work below standard. This will insure immediate attention, as it puts the responsibility squarely up to the foreman. When all the operations on a given part are completed in one department, the inspector's O. K. should be again required before they can be forwarded to the next one. There is no possibility under the Packard method of any lot of parts accidentally escaping inspection. The operator's pay, for every lot and every piece worked on, is absolutely contingent on the inspector's O. K. and every workman for this reason is continuously watchful to prevent negligence on the part of his department inspector. Even dishonest inspection has little incentive since the time-slips on file bear so complete a record that the responsibility for such work may be very easily determined. Thus at every step in the progress of a part it is possible to so check and safeguard it as to ensure its conformity to the standard of quality. To illustrate in detail a thorough method of supervising the maintenance of inspection standards, we may follow the development of a typical forging, the bevel driving gear, as carried through its various operations in the factory. In one respect this gear is given special inspection by receiving a supplementary analytical material test. The steel from which it is forged is given the regular laboratory analysis before being released to the Forge Division, but, in addition to this, because of the importance of the part in regard to both strength and quiet running, a material test is taken on each lot of forgings received. Chips are removed from a sample, and analyzed, and the whole lot are held until the result of the analysis is known. The blanks after release are heat treated and then sent to the lathe for boring and reaming the larger opening for the differential casing and turning the face of the web. The blank is then sent to the plate and the dimensions and surfaces checked. The piece is next taken to the milling machine and the four slots for the differential spider are cut. For the second time it goes to the inspector, to determine whether the slots are central, at right angles to each other, square with the surface of the web and true to size within a limit of one half-thousandth plus or minus. Next the outside diameter is rough-turned and the face angle finish-turned, making necessary the third trip to the inspection plate. Again the blank is sent to the lathe for finish-turning the outside diameter and the back angle and sizing the width of the tooth plane. This makes necessary the fourth inspection, after which, if passed, it is sent to have the face of the tooth-plane ground to the correct angle with the web. For the fifth time an inspector checks it before it is passed on to have the back of the web surfaced preparatory to copper-plating for hardening. After plating the teeth are rough and finished cut, which makes necessary inspection No. 6. The gear is next sent to the heat-treating department and first pack-hardened or carbonized. In the carbonizing pot along with each lot of gears is placed a test piece of the same material as the gears, about 6 inches long and .5 inches square. After the specified interval for this grade of steel, the gears and test bar are removed, cooled and reheated for hardening. After hardening they are cleaned and the test bar is broken and checked for depth of case, fineness of grain and general structural appearance, as an index of the internal condition of the gears. The gear is now ready for the most important of all its inspections, the strength and hardness test. Hardness is measured by the scleroscope, which compares the condition of the part with that of a standard established by the Brinnell testing machine. Between thirty and forty readings are taken from each gear. Strength is determined by the hammer test, a device which permits the concentration of a heavy blow of known force on a single tooth, each gear being given this test on at least four different points in its periphery. These tests may be considered as inspections Nos. 6 and 7, and are immediately followed by inspection No. 8, which is the test applied by a special fixture for determining the amount of possible distortion due to heat. This inspection is rigorous and minute, covering every tooth of every gear; and the gear that checks two-thousandths of an inch eccentric on the pitch circle is rejected. The diameter of this circle is 13 inches, but the limit of variation that any gear can show and pass is only one and one-half thousandths of an inch.

When successfully past this inspection the gear is ready to be ground on its outside diameter and on the face of the teeth and this in turn leads to inspection No. 9. Another grinding operation on the back and face of the web and again an inspector must check the accuracy of operator and machine, this time permitting a limit of variation of only one-half-thousandth. The final grinding is the finish of the opening for the differential case, which is followed by inspection No. 11. The last machining operation is the drilling and reaming of the differential casing bolt holes, which, in inspection No. 12, are checked for size and spacing. Absolute conformity to specifications is the standard for this operation, no variation being permitted. Not yet, however, may the gear be released as a finished part, as it may still fail on No. 13, the final inspection. This consists of a test on a special fixture again, for checking the correctness of the tooth-bearing and smoothness of roll, and but little less than perfection is required of the gear that is finally passed through. As a finished product it is obvious that a large percentage of the cost of the gear is due to the continual supervision of the inspector, but it should also be equally obvious that the result is an article as near to the ideal of mechanical perfection as the best of equipment, skill and scientific testing can achieve.

Assembly Inspection

In addition to the parts inspection, which should cover every item purchased or made for the car, all assemblies from the gasoline tank draincock to the motor should be checked in detail, both for accuracy of relation of their parts and for operation. The minor assemblies must be checked by themselves and then later as parts of large assemblies will again be inspected for location and function. This progression should follow through all the various stages of assembly, culminating in the motor, for instance, in the motor test room, where the engine, speeding under its own power, may be checked for every phase of construction and efficiency by its showing in operation under full service load. As a part of the chassis assembly it is again due to be checked, along with the others, for perfection of adjustment in the chassis road test. Bodies should be inspected—in the beginning, part by part—wood, glass, leather and cloth. Before entering the paint departments every one must again be gone over inch by inch and every minor defect, whether dent in aluminum or check in wood, sought out and corrected. Another inspector will pass it from the paint shop into the trimming department, and an expert trimmer's inspection O. K. should be required to get it from this department back into the finish varnish room. Before it is sent down to be attached to the chassis it must be given a last careful scrutiny for any possible defects of finish or workmanship, and in the finished car assembly department meet a chassis, which has come through only after a similar ordeal in its own paint department. After the car is assembled it should be inspected and checked with the specifications on the sales order for completeness and workmanship before being passed to the finished test department. Preparatory to the road test the motor is to be tuned up to the finest possible pitch of adjustment and inspected for quietness and flexibility before being turned over to the driver. As this test covers road performance it should be entrusted only to men of long experience and special aptitude and judgment. If passed, there remains only the attaching of any special equipment or accessories and the formal checking out of the car before submitting it to still another inspection, the most severe and critical of any it has endured. The sales department should have charge of this feature and their attitude should represent as nearly as possible that of the buyer. Not being subject to the control of discipline of the manufacturing department in any degree, they are free to exercise their judgment without fear or favor on every detail of construction, operation and finish. Their decisions are positive and final, and the car that, in their eyes, falls short of the desired perfection is rejected until brought up to this ideal.

Weaver Opens Discussion

The discussion was opened by E. W. Weaver, Peerless Company, who stated that he has given considerable study to this phase of manufacturing. In connection with that part of the paper dealing with selected stock, the question was asked as to whether this referred to the Packard company's own inspection or to the fact that the stock was bought selected from the steel maker. The latter was meant.

Henry Souther touched upon the inspection of material and pointed out that such inspection is a very important part of the manufacture which must not be dropped out no matter what other inspections are eliminated. The greatest damage is done by the purchasing departments in not ordering their materials far enough ahead so as to get proper inspection. If the stock is received enough in advance, it is possible to hold it up until its exact identity can be determined, thus preventing any inappropriate material from being used for the various parts.

F. E. Moskovics asked as to what relation the physical laboratory plays to the inspection methods, to which Russel Huff, Packard, replied that this laboratory has been practically turned over to the manufacturing department. The whole plant depends upon this laboratory for its specifications for materials for different purposes. These specifications are spread around the factory for the different departments in such a way that all materials are ordered in accordance with them. There is a regular form for handling the inspection in a routine manner. In this way all departments know just what kind of material is in a carload, as to its carbon content, and so on.

C. F. Fuller, Wayman and Gordon Co., emphasized the importance of testing for the physical properties of bar stock materials and forgings. He cited an example of a broken steering knuckle which came to his attention. Although the material of which it was made had the proper chemical constitution, its physical properties were absurdly deficient. This shows that it is necessary to test whatever you get, for although manufacturers can furnish the properties desired, they very often furnish materials which do not meet the requirements.

Wheels for Commercial Vehicles

From a Paper Read Before the S.A.E. and I.A.E. by Arthur J. Slade

THIS paper is the outcome of the writer's temerity in offering a suggestion to the Commercial Car Wheels Division of the Standards Committee, that, in considering the standardization of metal wheels, along lines similar to the standardization of wood wheels, certain practices, as to material and design, should be recommended for the benefit of the motor truck designer.

A precedent has been established by the Iron and Steel Division of the Standards Committee, in recommending good engineering practice; as for example:

"Steel castings for axles, crankshafts, and steering spindles are used only at a great risk."

The chairman of the Commercial Car Wheels Division, and the secretary and general manager of the society, did not, however, view the proposal with approval, but suggested a paper for presentation at this meeting, with a view to bringing out available information as to suitable material and designs for truck wheels, through those members best qualified by experience to express themselves on the subject with authority.

It is perhaps natural that wheels built of wood should have been developed to a high state of perfection in this country where such a large and varied supply of wood is available. The rapid development of the West called for vehicles of rugged and sturdy type for the pioneer's use in opening up a country without roads of any sort. Later the transportation companies, operating stage coaches over roads little more than trails, as new sections were settled, and eventually the agriculturist, who even now often operates his farm wagons over roads unworthy the name, demanded the highest quality of wheels.

The majority of the motor trucks built in this country have been equipped with wooden wheels; the earlier wheels conforming closely to the design of horse-drawn wagon wheels, especially with regard to size of spokes, but also, in some instances conforming to wagon-wheel practice even to the extent of wooden hubs. Some of these wheels, dating back perhaps 10 or 12 years, are still in service on motor trucks in New York City.

Development of Wood Wheels

The first radical improvement was in the substitution of metal for wood hubs, primarily to make possible the use of anti-friction bearings. Next came a radical change in the matter of spokes. When it is considered that a wagon wheel on a 5-ton capacity vehicle seldom has a tire exceeding 4 inches in width, whereas the tires on the 5-ton motor truck will usually total from 10 to 12 inches in width, it becomes obvious that the wide felloe on the truck wheel should be supported by a spoke of much greater width than the narrow felloe of the wagon wheel. Since 1907, when the importation into America of one of the most successful European trucks began, the improvement in the design, as well as construction, of wood wheels has been very marked. At that time one of our leading wheel builders undertook to practically duplicate these European wheels with spokes about 5 inches in width, flaring at the outer end so as to form an adequate support for the felloe, and also of sufficient cross-section to insure a good shoulder on the end of the spoke against the inner surface of the felloe. Ever since that date the wheel builder in question has been manufacturing wheels, from designs similar to this, with great success; and, although some other wheel builders contended at the time that it was not feasible to procure wooden billets of a size suitable to finish spokes of such unusual dimensions, the majority, if not all, of the wheel builders catering to the motor truck industry are now building wood wheels of this general type.

Early Metal Wheels

It must not be assumed, however, that the practice of motor truck builders in this country has been confined exclusively to wooden wheels. As far back as 1858 and 1862 motor trucks are reported to have been built, in an experimental way, with steel wheels. In the years 1903 and 1904, when the motor truck industry in this country was making a definite commercial start, the Gibbs Engineering & Manufacturing Co. equipped trucks with cast steel and steel disk wheels. The cast steel wheels were similar to those now being advocated by several manufacturers, having hollow spokes integral with hubs and felloes. They were made of crucible steel and used a tire constructed from a combination of wood, steel and rubber. About twenty 5-ton trucks were built and the wheels were found to be on the whole satisfactory. The disk wheels were made of boiler plate, riveted to cast steel hubs and to a steel tire band. These wheels were also said to have given satisfactory service, but the company building the trucks in question no longer exists. One of our members who was identified with the production of these vehicles will, it is hoped, contribute some discussion on this paper.

In 1905 the Couple-Gear Freight Wheel Co. brought out a line of trucks equipped with wheels made up of steel plates. In the interior of the wheels an electric motor was mounted, and this same construction has been followed by that company up to the present date. At about the same time the Four-Wheel-Drive Wagon Co., of Milwaukee, brought out 5- and 10-ton capacity gasoline trucks equipped with wheels on which the tires were segments of rock elm and the side plates were steel disks. This company is not now in existence.

In 1906, a metal wheel, known as the "Indestructible Steel Wheel," was introduced to the market in Chicago. These wheels were built of side disks of steel, reinforced inside with structural shapes; the various members of the wheel being riveted together. They were used on trucks built by the Reliance, Commerce, Rapid, Plymouth, Grabowsky and Packard companies, of which all but the latter have discontinued manufacturing, and the Packard company only used a limited number. The Rapid company is said to have continued their use the longest, covering a period of about 2 years. The severe strains and shocks due to irregular road surfaces are reported to have loosened the rivets holding the various members together, and the wheels were not found to be permanently satisfactory. It is hoped that some member of the society present may have had personal experience with this type of wheel and can give us information regarding its value.

In 1908 the Morgan truck of 5-tons capacity was brought out with a disk type of cast steel wheel which proved unsatisfactory and was superseded in 1910 by a cast steel wheel with spokes of the general design with which we are familiar.

In 1909 the White company introduced steel wheels on the larger sizes of their commercial vehicles. It is understood that modification of the design of these wheels was necessary to eliminate breaking of the spokes near their point of union with the felloe, and their present design seems comparatively free from breakage. The A. O. Smith company on their heavy gas trucks have used cast steel wheels since 1911. The same is true of the Locomobile company on their well-known trucks.

From time to time trucks have been imported from abroad equipped with steel wheels, notably the Orion, Bussing, Gaggenau, etc. However, the best known European trucks coming into this country are equipped with wood wheels, notably the DeDion and Saurer. I wish to acknowledge my indebtedness to Mr. Charles E. Stone, member of this society, for his assistance in compiling the above facts.

Current Practice

It will be noted that comparatively few well-known truck builders in this country are at present using metal wheels and those who are using them have not previously used wooden wheels.

There is one notable exception, however, the Pierce-Arrow Motor Car Co., on some of whose trucks I have recently seen cast steel wheels, although since the introduction of the Pierce 5-ton truck on the market wooden wheels have been standard. It is hoped the engineers of that company will give us the benefit of their experience and their reasons for making this change.

The majority of motor truck manufacturers, including those whose product dates back to the beginning of the motor truck industry in this country, have used wooden wheels consistently, improving their design from time to time, but not abandoning a material for wheel construction which has on the whole proved entirely satisfactory.

Through the courtesy of Mr. George R. Wadsworth, member of this society, I have been furnished with reports on the mileage and condition of the wood wheels on a large group of gas trucks of 3-, 4- and 5-ton capacity, which show that in some cases

the mileage covered approaches closely to 70,000. On the assumption that the tire mileage secured on these trucks is 10,000 miles per tire, this would mean that some of the wheels have been subjected to six tire changes. The report states, regarding these wheels, that "they were all in first-class condition and not a moment's inconvenience or delay has been caused by them and there is not the slightest indication of trouble in the near future." These wheels, it is scarcely necessary to say, are of modern design, are accurately constructed of suitable material, and are carefully inspected for conformation to the accepted S. A. E. motor truck wheels standards. The contention that wood wheels get out of round and present difficulties in tire application does not seem to be substantiated in this case.

As pointed out in papers on wood wheels, presented by Mr. Bert Morley and Mr. C. B. Hayes at the January, 1912, meeting of this society, there is no question as to the adequacy of the supply of wood for wheel manufacture. The experience of many of our members with wood wheels on motor trucks, extending over periods of years, indicates that the truck manufacturers in this country are not being forced by necessity to adopt metal wheels, so that if the truck manufacturer who has been using wood wheels satisfactorily for many years is to be influenced to adopt a metal wheel, it is essential that he should be shown that some practical advantage would be gained by the change.

When this society visited our British fellow engineers, several members of the American party made inquiries regarding the service rendered by metal wheels, in both England and France, and the results of the investigation were set forth in a short report which I made to the society at the January, 1912, meeting. Briefly, it was found that cast steel wheels were being used in England in a variety of forms. Also that structural steel wheels were preferred by some. Further, that the consideration of wood wheels had not been abandoned, even by those using steel wheels as a standard, and that some truck manufacturers preferred wood to metal, and used the former as standard. In France the wood wheel appeared to be the standard to the practical exclusion of metal wheels.

More recently Mr. L. C. Freeman, a member of this society, submitted a paper on "Tendency of Foreign Motor Truck Design" at the January, 1913, meeting in which he made the following statement: "While cast steel wheels seem to give very good results under certain conditions, they do not appear to be a universal panacea for all wheel troubles. One user who has operated a great many trucks of many different makes said that cast steel wheels were all right until the tires wore thin. In this statement I think there is food for a great deal of thought. A built-up wheel of structural steel was giving him excellent service and almost no trouble." Doubtless some of our British fellow engineers present at this meeting can supply us with up-to-date information on the status of the metal and wood wheel in Great Britain.

Claims for the Metal Wheels

At the present time there is undoubtedly a general effort being made by manufacturers of parts for motor trucks to add metal wheels to their product; and with the exception of one manufacturer, who proposes to build wheels of malleable iron, all of them are building their wheels of cast steel.

What, then, are the specific advantages offered by metal wheels which should influence a motor truck designer to specify metal construction rather than wood? The advantage must be such that it can be proved to the purchaser of the truck that he will secure an actual financial gain by the change which the engineer proposes, because to the purchaser the prime questions are the expense of operating and maintaining the truck over a period of years and the earnings or savings which the vehicle will effect. Theoretical considerations, unless borne out and proved in practice, are unavailing. Practical service conditions count with the hard-headed business man—not laboratory or experimental tests and calculations.

First, it is claimed by one of our members, who is chief engineer of a company about to place cast steel wheels on the market, that: "It is now conclusively proven that there is a distinct saving in tires on steel wheels. Some of the largest tire manufacturers guarantee as much as 30 to 40 per cent. longer life on steel than wood." Inquiry made of the leading tire manufacturing companies, verbally or by letter, has failed to verify that statement. The opinion of several tire company officials seems to be personally in favor of metal wheels for the one reason that they are likely to be made more accurately to size, but the tire companies positively decline to guarantee an added mile or to even express the opinion that added mileage can be expected.

As to the question of accuracy of workmanship, it is entirely feasible for the wood wheel manufacturers, under the present S. A. E. standards, equipping the wheels with S. A. E. bands, to work within the necessary tolerances and provide wheels which will have the accuracy required. Accuracy in workmanship is a question of care in construction and careful inspection and the manufacturer who insists upon accurate wood wheels conforming to S. A. E. standards has no trouble in securing them.

Another claim made for metal wheels is that their strength is greater than wood wheels. Assuming the cast steel wheels to be free from defects, and to have the chemical and physical characteristics recommended by the Iron and Steel Division, these wheels certainly develop marvelous resistance to shocks. I witnessed a test of such a wheel recently which was subjected to the impact of a weight swung as a pendulum against the side of the felloe and the wheel was deformed beyond the semblance of a wheel and even then did not show any fracture. At the same time, as has been pointed out by the Iron and Steel Division, steel castings can not be inspected against blow holes, and had the wheel in question contained some concealed defect, failure in testing would probably have resulted. The difficulty in securing uniform steel castings free from defects and conforming to the S. A. E. standards is generally conceded and several of the foundries making cast steel wheels in this country, at the present time, are having difficulty in making steel castings of other motor truck parts which will pass the inspection of some of their customers. As to the strength of well constructed and properly designed wood wheels, the front wheel of a truck manufactured by one of my clients came in contact recently with a road obstruction with such impact that the strain broke the steering gear, but the wheel was uninjured, and on another truck a rear wheel was subjected to such an impact that the axle spindle was bent without injury to the wheel. Therefore, on the question of strength, that of the high-grade wood wheel is entirely adequate for commercial purposes.

The contention is also made that the metal wheel will dissipate heat more effectively than the wood wheel. There has come under my observation no case in which a truck tire on a modern motor truck has been injured by lack of heat radiation under service conditions. I assume that the heat developed in a solid rubber tire is due to the deformation of the rubber and this is greatest near the surface of the rubber which comes in contact with the ground. This surface is in contact with the air and I should expect that the heat would be radiated through the air more easily than transmitted through the base of the tire to the wheel and hence radiated by the wheel, felloe, and spokes.

Cost and Weight

The fourth point in considering the relative merits of wood and metal wheels is the comparative cost and weight. From information received from one of my clients regarding wood wheels being regularly manufactured and used on this company's trucks, and from information received from the chief engineer of one of the companies which is bringing out cast steel wheels, the following comparison of weight and cost has been made:

Set of wheels for 3-ton truck to take 36-inch by 5-inch tires, front; and 40-inch by 4-inch dual tires, rear; wood wheels equipped with S. A. E. band and Timken hubs and flanges—steel wheels having band and hubs integral—

	Weight	
Wood	Steel	Increase of Steel over Wood
Front 122 lb. each	151 lb.	12.4%
Rear 212 lb. each	373 lb.	76.0%
Set 668 lb.	1048 lb.	57.0%—380 lb.
	Cost	
Front each $20.00	$26.80	34.0%
Rear each 30.00	52.10	74.0%
Set each 100.00	157.80	57.8%—$57.80

Information obtained from a European manufacturer of cast steel wheels indicates that their weight is substantially the same as American cast steel wheels, but the price is 25 to 50 per cent. higher, thereby placing the steel wheel at a still further disadvantage as far as cost is concerned. Consequently, it would appear that the cast steel wheels are both costlier and heavier than the wood wheels. The burden of proof seems to rest with the metal wheel manufacturer, that they have an economic advantage over the wood wheels, resulting in a financial saving to the owner of the truck equipped with metal wheels.

Drop Forgings

There is one type of metal wheel which might overcome the disadvantage, real or fancied, of the wood wheel, and which would at the same time eliminate the element of risk always existent in a casting, and also the criticism of the built-up structural steel wheel, the loosening rivets. This is the drop forged wheel. Drop forgings of high-grade steel, which after suitable heat treatments, develop extraordinary physical characteristics, would, in my opinion, be an ideal construction, unless their first cost proved prohibitive. I hope we may hear something from the drop forgings experts among our membership in regard to the feasibility of such a construction for motor truck wheels.

As stated at the outset of this paper, its purpose is to stimu-

late discussion and secure additional data, by which the motor truck designer may be benefited and assisted in his work. I trust it may accomplish its purpose.

Letters Begin Discussion

At the conclusion of this paper several letters from engineers who had been invited to comment on the paper were read. Pertinent remarks on the subject were made in these letters. H. D. Church, Packard company, stated that, in his opinion, the steel wheel would not stand up under difficult service with the certainty of other types of wheels. He advanced it as his belief that a better wheel would be developed than the metal wheel now on the market, that this wheel would be of metal but that the wood wheel would be used until that time.

A. M. Robinson, Locomobile company, stated in his letter that he thought the opinion of the London bus company would be most valuable since they were the largest users of commercial cars in the world. In reply to a letter which he wrote them stating that he understood that they were using the steel wheels on more than 2,000 buses they replied that this was the truth and that they further intended putting them on all their new buses. Mr. Robinson expressed the opinion that the use of the steel wheel increased the tire mileage to a considerable extent and that the difference in resiliency between the metal and the wood wheel amounted to practically nothing.

Benjamin Jerome stated that the Couple Gear company had had success with the structural steel wheel and that there are now in use by this company's cars, wheels of his type which have been in continuous service for 7 years.

Phineas Jones, the wheel manufacturer, stated that while a wood wheel man he did a large amount of repair work on wheels of all types. He stated that in his opinion the two main faults in the wheels which found their way into the repair shop, speaking of wooden wheels, were in workmanship and design. The main fault in workmanship was that the rims were not properly shrunk on and the main fault in design was that the wheels did not have enough spokes.

H. W. Alden, of the Timken company, stated that the paper hit the nail squarely on the head. He said that in his opinion it is too early to predict the ultimate wheel but under the present conditions the wood wheel did not do well in a dry country and that in this work there were many trucks with cast iron wheels that were giving the best of satisfaction. He stated that the tubular construction was the strongest and had the best appearance, the hollow box rim being best for the S. A. E. tires. In Mr. Alden's opinion the malleable castings are cheap and the box rim is the coming practice.

Ralph L. Morgan said in his letter that welding costs ran up so high that he found it cheaper to use the cast iron wheels. The difficulties of plate cracking he said, were chiefly connected with the lighter wheels.

Mr. Powers stated that the engineer naturally and instinctively looked for a metal to use as a material in the manufacture of wheels. He further stated that our attentions should be directed towards the British experiments with these wheels as they are much more complete and conclusive than any carried on in this country. Endurance is the vital consideration and our attentions would be directed towards this. The motor truck wheel industry is new and is progressing rapidly. The first thing that had to be done was to break away from the practice of the wagon builder which was at first followed. We have an ample timber supply here for several years and when that is taken into consideration with the fact that the wood acts as an absorber of vibration, the good effects on other parts of the mechanism are apparent.

Mr. Farrel, as a manufacturer of steel castings, stated that he believed that nothing in the way of steel casting manufacture offered any easier field than did the manufacture of the steel wheel. Referring to the statement in Mr. Slade's paper in which he stated that the wheel that was tested was not noted for defects, he stated that the particular wheel had many visible as well as invisible defects. He further stated that it would be easy to manufacture steel wheels on a competitive basis if they were ordered in anything like the quantities that wood wheels are ordered.

J. E. Hale said that as a tire manufacturer he had found that many of the troubles he had found were due to the fact that the wheels are out of round. He also stated that a well-built and well designed wood wheel was a rigid proposition and did not differ much from the steel wheel in that respect. The opinion was also advanced that there were many instances where the tire makers were not holding to all the S. A. E. specifications.

Mr. Clarkson, of the I. A. E., stated that he believed the weights furnished by Mr. Slade were too high. Taking the example of the London bus company, the wheels were 437 pounds per set lighter than those Mr. Slade had specified. Forged wheels in English practice weigh 440 pounds per set for a 3-ton truck and cost about $30 more than the wood wheels. He stated that none of the wood wheels they could get would stand 60,000 miles of London road service or an equivalent of 2 years.

Mr. Courtley stated that he had had considerable experience with wheels made from electric furnace steel and that this material had given exceptional results. The absence of blowholes is a strong point.

Keeping Track of Tires for Automobiles and Trucks

(*Continued from page 1305.*)

of the customer, the time of starting and finishing work on the job, the total time spent on it and the amount due to him for this work. The materials-used card is not shown here. It is marked with the number of the job and the name of the customer, and on it every bit of material used in connection with the repair is recorded. The tri-section card, Fig. 2, consists of a work order, a claim check and an adjuster's slip which is attached to the tire with a string, being fitted with an eyelet for this purpose, the same as the Firestone blank.

Record System for Users

The activity of tire makers, however, does not stop with the record of sales and repair work. The proof of this statement is that the B. F. Goodrich Co. has devised a users' record system to be used on trucks equipped with Goodrich tires. This record system consists of a twelve-page book, each page representing a monthly expense sheet giving an opportunity of recording every bit of the expense of operating and maintaining the truck. Reference to Fig. 5 shows the exactness used in the drafting this form, and it may well serve as a simple and fundamental blank for truck users to keep their costs on.

The basic card in the Goodrich cost system is the driver's daily report card, Fig. 6. This card, 7 by 4 3-4 inches in size, is printed on thin, tough stock and is designed to give not only the usual information presented on a driver's report, but also full particulars in regard to the tires used.

Across the top of the card are written the number of the vehicle, its make and the date. The driver signs his name and inserts the time the report was turned in or made out below the above-named items.

These essential details having been disposed of, the remainder of the card is devoted to the information pertaining to the vehicle and its operation. Tires are classified according to the wheels on which they are carried, particulars covering the right front tire being given under the caption R F, etc. Here the tire make, size, type and repairs and cost are to be inserted in each case.

Next come data covering the day's work of the car, the weather, temperature and road conditions being given first place.

Below the space for this information, the card is divided by horizontal and vertical lines into spaces for the recording of details concerning the operation of the vehicle. At the left, under "Left and Arrived" the driver notes his destination in each case giving below "Time," the time of his arrival at, or departure from, a loading or unloading point. The mileage covered to and from each point follows, with the number of pounds of load taken from the loading point and the number of pounds unloaded at each stop. There are spaces for data covering six trips on each card.

At the bottom, a heavy, black line is printed across the card, dividing the totals of each column from the detailed information given in each column.

The bottom of the card is left for the notation of data such as the amount of current or gasoline used, the amount of oil used, the number of miles per gallon of gasoline and the speed of the vehicle in miles per hour.

The driver is instructed to report on the back of the card any irregularities in the operation of the trucks that he has noted during the day or any mechanical or other troubles he has had in making his truck operate to its greatest efficiency. Delays at unloading or loading point should be reported by the driver as well as all mechanical troubles, for the former influence the efficiency of a commercial vehicle fully as much as the latter.

To Reduce the Expense per Mile

All these systems show the endeavor of the tire makers to give their customers efficient and economic service. The idea is to reduce the expense of each user per mile, so that he can obtain a maximum of mileage from every tire used, and the consequent expense of the adjustment department is considered as indirect advertising expense. This is to be understood as follows: prompt service must necessarily satisfy the user who gets his benefit, and any man informed by his neighbor that such-an-such a tire company is very liberal about making adjustments and informing the user how to make cheap repairs himself and helping him in every way to increase the mileage received from his tires will buy from the company thus recommended to him by a responsible acquaintance. This shows the truth of the oft-quoted adage, "Nothing counts like service."

The Rostrum

In which Letters from Readers Are Answered and Discussed

Gearbox Discussion Attracts Comment

Oil in Cylinder Due to Bad Piston Ring—High Compression Makes Motor Difficult to Crank—Ether and Kerosene Recommended for Carbon Remover

EDITOR THE AUTOMOBILE:—A gearbox in unit with the motor enables the clutch to be inclosed, giving a very neat appearance; it is easily, and therefore cheaply, manufactured. Regarding simplicity, this depends upon the design of the unit, as some cars using unit power plants are readily accessible, while others are anything but accessible. Regarding flexibility, this type of construction can be hung so as to be undisturbed or thrown out of line.

The amidship position is very good for heavier and higher-powered cars, when used without a sub-frame. However, the manufacturing expense is greater, and the extra universal joints, while no doubt in many cases trouble-proof, require lubrication from time to time. This construction insures a good distribution of the weight on the frame.

The rear axle location is one that requires much more thought and study than the average designer who has attempted this design has given it. The drawback is not the additional unsprung weight, but the absolute necessity of swinging the propeller tube and gearshift levers from the same point. If this is not followed out, one of the most simple laws of mathematics is not taken into consideration and undue, and to say the least, unnecessary, wear is imposed upon the transmission gears. The fact that practically all of the manufacturers of all rear axle gearboxes, as well as the manufacturers of cars having rear axle gearboxes, have found it necessary to make changes from time to time and to add gear locks and to change the location of the gearshift lever goes to show that they have been having more or less trouble. Then, again, on account of the fact that the distance between gearbox and gearshift lever calls for long shifting rods and connections, there is bound to be play sooner or later in these linkages, which means that when the gearshift lever is in its proper place the shifted gear is not. In other words, the two foregoing statements prove that the gears are not having a fair show as they are transmitting power when only partly in mesh.

It is granted that by placing a universal joint between the differential and rear axle gearbox these disadvantages can probably be overcome; but why not use either the unit or amidship construction and thus do away with this unnecessary wear and tear on the gearbox gears, one of the most delicate parts of the modern motor cars?

New York City. M. H. POTTER.

¶*In answering this question car owners are directed to the fact that one of the leading arguments advanced against rear axle location is that of increased axle weight and consequent tire damage. Definite information on this line would be in order.*

¶*Those not in favor of the amidship location have urged against it lack of accessibility.*

¶*The gearbox as a unit with the motor has been criticised in that it is not suitable for a heavyweight car because of the fact that too much weight is placed in front.*

Oil Leaks Past Piston Rings

Editor THE AUTOMOBILE:—I am having some trouble with one cylinder in my model 10 Buick. Starting out with clean spark-plugs I can run for 15 to 20 miles without a skip, then the plug in this particular cylinder begins to miss fire and the engine skips badly. This particular plug will be covered with soot and by cleaning it will run about the same distance again when the same trouble begins. I have ground the valves and compression is as good as in the other cylinders. I have used Rajah, Champion and have now put in a new Wizard plug with the same result. The plugs in the other cylinders run for a month without cleaning. Do you think this trouble is due to poor piston rings, which let the oil suck up into the combustion chamber? Would new rings remedy this trouble?

Slatersville, R. I. E. O. C.

—Your diagnosis of your trouble is no doubt the correct one. It might be though that, instead of your rings being faulty in that particular cylinder, the joints have lined themselves up and allow the oil to pass through the channel thus provided. In either case you will have to take down the motor and if you are careful in taking it down not to change the position of the ring, you will be able to ascertain to what the trouble is due.

Has Hard Time Starting Car

Editor THE AUTOMOBILE:—I have a Lion car 1911 model, 40 horsepower. It was overhauled this spring, all looked over and the old wires taken off and new wires put on, as I was bothered some with short circuits. The engine was in good condition and I was not obliged to take it down at all. It has good compression and it would be impossible to spin it when cranking with the coil. The magneto has been looked over and put in first-class condition and the car is running well. It will take lots of spark before it will knock, but a man would have to be a horse to crank it to make it fire and the hotter the engine the harder it starts. I prime it every time I undertake to start it. It cranks on batteries and my batteries are good; not under 20 amperes. When I first got the car it would crank on batteries that tested 5. It will go every time as soon as it is primed. Very often if I am on a grade and I get tired of cranking I let it run down the grade with my clutch out when under fairly good headway. It will start on either magneto or batteries. I have a new Stromberg carbureter this spring. There is no skipping or back firing. I presume you will say it is the gasoline as all trouble at the present time is laid to carbureter or gasoline, but the gasoline I am using tests 65 the same as

last year. I have a tester and test it myself. Could I put a Gray & Davis starter on my engine to overcome my starter troubles?

My spark-plugs burn off clean. They do not soot. They are of a reddish color. By rubbing your finger on the sparking points they will brush off and are as bright as if sand papered.

Sanquoit, N. Y. W. H. C.

—The reason that your motor is hard to crank is naturally on account of its high compression. As this is a desirable feature in an engine, it is difficult to suggest a cure except fitting a starter. This will not make the engine easier to crank, except that you will not have to do the cranking. The Gray & Davis starter is entirely a manufacturer's proposition and cannot be fitted very well to a car that is already in use, unless you go to an extremely high expense. There are many of the electric starters, however, which can be fitted to the car after it is out of the manufacturer's hands, or if you do not desire an electric starter particularly, an acetylene starter or one of the spring type can be fitted. If your motor runs well and shows no tendency to overheat there is no use in making any changes in the motor itself.

Wants Two Sets of Dry Batteries

Editor THE AUTOMOBILE:—I want a diagram for connecting up dry batteries in two separate sets for a two-way switch. The wiring I want to know about is this, to wire a car without a magneto so I can have two sets of batteries, so that I can use either number one or two. C. A. L.

Thompson, Pa.

—The outfit you desire will simply consist of two sets of batteries instead of one, no duplication being necessary on the coil or timer. The two battery sets should have a single ground as shown in the wiring diagram given in Fig. 1. The other terminals of the battery sets are connected with the two-way switch, so that either one can be thrown into circuit with the primary terminal of the coil. With this method of wiring one ground connection will suffice for the whole system In Fig. 1 is shown the regular coil for two sets of batteries as put on the market by Splitdorf.

Believes Valve Stems Worn

Editor THE AUTOMOBILE:—In looking over L. E. Grant's troubles with a Ford T 1911 and your answer for this fault I think you have missed it. I had this trouble with a Ford myself and found the cure, or a great help, in this trouble to be had by putting in a new set of intake valves. The stems of these valves wear, and when the engine is throttled down to low speed a vacuum is formed in the manifold around these stems, causing raw or fresh air to rush into the manifold, making the mixture too weak to fire.

Poplar Bluff, Mo. T. G. VAN SANT.

—On page 1178 of THE AUTOMOBILE for June 5 L. E. Grant speaks of having trouble with his car, in that it misses fire and jerks at low speed. As the car has been run only 2,650 miles, the possibilities are more in favor of wear on the valve seat than on the stems. Since there is certainly an air leak in the car it would be well to look at both parts of the valve.

Ether as a Carbon Remover

Editor THE AUTOMOBILE:—About a year ago a friend suggested as a method of removing carbon from the cylinders of an automobile, to allow the motor to suck in a mixture of ether and kerosene through the carbureter or through a petcock in the manifold just above the cabureter, Fig. 2. His plan was to introduce both liquids in a mixture of equal parts with a dash of lubricating oil. Do you think that such a combination would be effective in removing carbon? Kerosene itself should answer the purpose, but how about ether or the concoction made through the mixture? Could any harm be done by using this, say once every two weeks? My friend said that this was a secret method used by some garages which charged $25 for importing the method by which the cylinder cleaning was done. I should like to see this discussed in your columns.

New York City, N. Y. H. D. MARTIN.

—Ether is a very powerful solvent and no doubt would be a very active agent in ridding the cylinder of carbon deposits. Kerosene also is effective and has been used in the way you mention for some time. It seems reasonable therefore that the mixture of the two should work out very well. If any readers have experimented with it THE AUTOMOBILE will be very glad to learn of the result obtained in actual practice.

Touring Adirondacks and White Mountains

Editor THE AUTOMOBILE:—I would like to have you plan an automobile trip for me, taking in Lake George from New York City, Saratoga Springs, Lake Champlain via Burlington, Vt., to Bretton Woods, N. H., White Mountains, taking in the Adirondacks.

Baltimore, Md. J. H. W.

—You can cover the country briefly outlined in a very interesting tour which will combine mountain scenery with some very pretty stretches of undulating country. Leaving New York and following closely along the course of the Hudson River, you pass straight up Broadway to Ossining, 29 miles from Columbus Circle, New York City. Here you come to the end of the road and you turn to the right on Highland Avenue, swinging

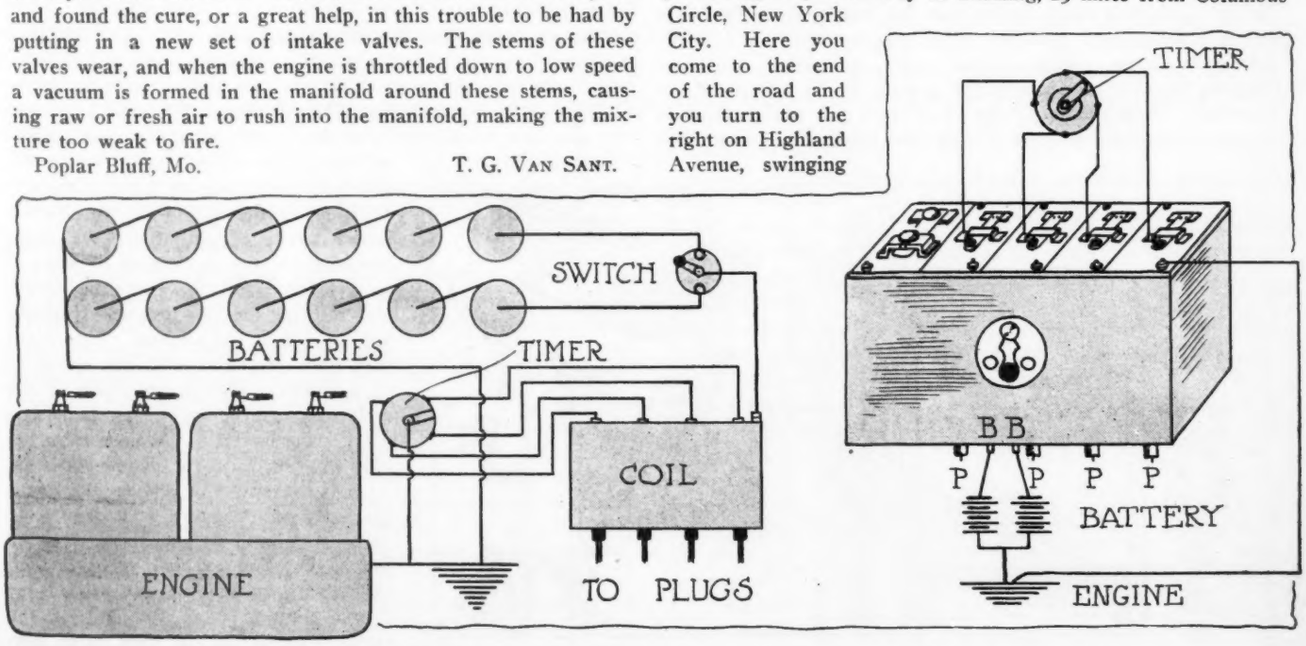


Fig. 1—Wiring diagram with two sets of batteries and Splitdorf coil arranged with two-point switch

again north through Harmon, Peekskill, and finally following the road signs into Poughkeepsie, which is 72.5 miles from Columbus Circle. Much of the country passed through along this route will be of historic interest. The homes of the early Dutch settlers in a few instances still remain intact. The homes of Washington Irving and the son of Alexander Hamilton may be seen, as well as the little cemetery of Sleepy Hollow made famous by the legends of Washington Irving. Between Poughkeepsie and Albany the points of interest also have a historic value, as well as a modern one. Just above Hyde Park is the home of John Burroughs, the naturalist, the spot where Fulton built the Clermont, and many other points of interest relating to the fortunes and misfortunes of the early settlers and the Indians. Leaving Poughkeepsie on Main street, the route lies through Hyde Park, Red Hook, Hudson, Rensselaer, and into Albany.

From Albany you have a straight run to Lake George over the main trunk line, passing on the way through Saratoga Springs and Glens Falls. You should not travel by way of Schenectady but through Troy instead, as the road between Saratoga Springs and Schenectady is under construction.

From Lake George you can follow the main trunk line to Ticonderoga and thence, if you so desire, through Westport and Plattsburg. At either one of the latter places you can get a boat to take you to Burlington, from which point the White Mountains are readily accessible. There is a through route from Burlington to St. Johnsbury by way of Waterbury, Montpelier, Marshfield and Danville. This is a dirt road but is in good condition and the scenery along the route is magnificent. From St. Johnsbury to Bretton Woods is a run of 37.6 miles over dirt and gravel road. From Bretton Woods there is a choice of routes to return by way of Portland or Concord and thence to Boston. From Boston back to New York any one of the intercity routes may be followed.

Why Is Four More Economical?

Editor THE AUTOMOBILE:—Of the reasons given in reply to the oft-repeated query, Why a six takes more gasoline than a four, it seems to me that "the increased radiation of heat by reason of the greater cylinder wall surface" is the most far-fetched. As the price of gasoline is receiving so much attention the discussion of any means for greater economy would be very appropriate. To one accustomed to the working of the steam engine, the increased quantity of gasoline seems strange in a six. Throttling down a steam engine uses less steam, while there is a loss in a steam engine the length of port passages (in a three-port slide valve), piston clearance, etc. A Corliss valve type has less loss, but the loss is not greater in proportion to the throttling. In a single-cylinder, four-cycle gas engine there is one power stroke and three strokes that produce no power, but rather consume power. Consequently this one power stroke must not only be equal to the work to be done, running friction, etc., but also give the flywheel mass sufficient momentum to carry on the work during the other three strokes and the compression—something the steam egine does not have to contend with. Consequently, it is not throttled down so closely and has higher compression, in a four-cylinder more power, less power per stroke, closer throttling, greater loss than in a single cylinder, a six being a continuous power, increased throttling with greater loss than a four.

For greater elucidation of this loss, take the sketch, Fig. 2, which is an illustration of an ordinary L-head engine, also a modification of it. Take it first as an ordinary type. Say the piston stroke is from the line A B to the line C D, say 4 inches, and for easy consideration say this space is equal to 2 pints. The compression space above the line A B is equal to one-third of the 2 pints, or 2-3 pint would give 50 pounds compression pressure. Now, on the exhaust stroke the piston can shove the foul gases from the line C D up to the line A B, but above this line the expelling power of the piston ceases. Consequently, the next charge drawn in, if a full one, is handicapped with one-third its volume of foul gases to retard its ignition and combustion. If not a full charge, it is greater than one-third fouling. Also back pressure by the muffler has the same effect. When the fresh charge is drawn in these remnant foul gases are driven down on top of the piston, and at the end of the suction stroke theoretically occupy the space between the lines F A and C D, or one-quarter the space of the cylinder volume.

In W. C. Marshall's description of the O'Kill pressure indicator in THE AUTOMOBILE for May 29, he describes an engine of similar proportions having a compression pressure of 50 pounds per square inch, giving an explosive force of 212 pounds per square inch, yet which, when throttled down, gave only 7 pounds compression and 10 pounds explosive force. An indicator card taken from an air compressor that used water to fill the clearnace spaces shows that a charge must be compressed to about 72 per cent. of its volume to make 7 pounds compression. Two-thirds pint at 7 pounds compression would require a little over one-fourth pint addition to give it volume at atmospheric pressure. The difference or loss is, roughly speaking, with throttling, one-seventh of the compression and one-twentieth of the explosive force, but using one-eighth if the amount of explosive mixture, the mixture being handicapped with nearly three times its volume of foul gases to retard the sparking and explosion.

The slower-burning mixture giving such a reduced explosive force is what puzzles the steam user and prompts the query. Now, as a remedy for this loss, compare the second type of the sketch, which is a representation of Patent No. 1,062,494, using the same length of suction stroke, compression, etc. But instead of the piston ending its stroke at the line C D it continues on down to the line H I, twice the length of the former power stroke or with twice the crank leverage for the application of the explosive force, and also twice the expansion utilizing the heat that was formerly thrown out in the muffler. This extra expansion dispenses with the necessity of a muffler. This is one phase of the reclaiming of the loss. As the piston reaches the line H I, the slide valve begins to open. As the piston starts on its exhaust stroke it shoves the burnt gases through the now wide-open slide valve port until it almost reaches the line C D. The exhaust valve E then begins to open and the exhaust is continued through it to the end of the stroke (meanwhile the slide valve running at crank shaft speed, but 90 degrees

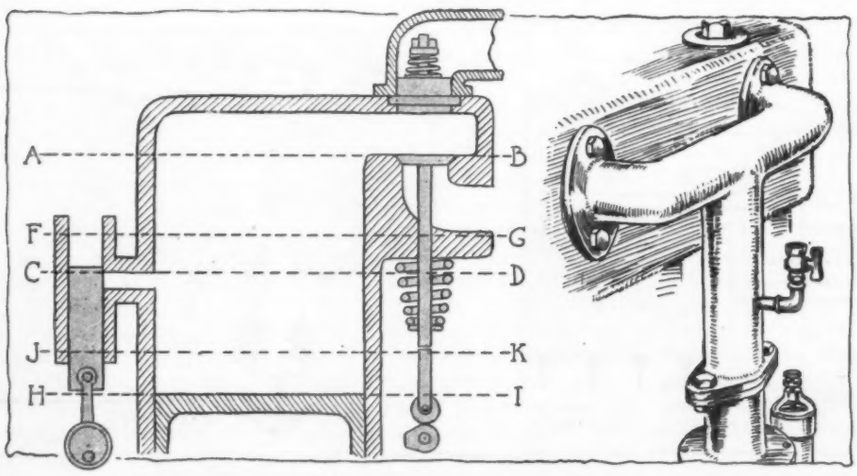


Fig. 2—Diagrammatic view of L-head motor—Petcock on manifold

late, has closed its port), the valve E remaining open, the piston on beginning its suction stroke draws in air through it until the piston has reached the line C D, the valve E closing. The mixture is drawn in through the inlet valve until the piston has reached the limit of its stroke, the line H I. Here the remnant foul gases occupy the same position in relation to the piston between the lines H I and J K, the slide valve again opening the piston on its return or compression stroke. Now it will be noted that the foul gases occupy the space between H I and J K, air between J K and F G, and above F G the fresh mixture, two valves at the top being closed. The piston shoves on the foul gases, these on the air, and the air on the mixture. The air, being at the slide valve, port is forced out through it as the piston comes up, the foul gases being the last forced out, thus obtaining complete scavenging. Also observe that the action forces a compact filling of the upper or explosive end of cylinder, peculiarly fitting it for a high-speed engine, fresh air occupying the space (which in the first type was filled with foul gases) on top of the piston, increasing the explosive force by greater oxidation. In a recent issue of THE AUTOMOBILE was reported a discussion by the S. A. E. in which Howard Coffin was credited with saying that "A quantity of air on top of the piston would create an explosive force the present type of engine would be unable to withstand." Here we have a simple and practical embodiment of this noted engineer's idea, but further economy by further expansion. The mixture intake stroke being 2 pints, would not go below the line F G, no loss through slide valve port, for a lighted torch held there gives no flame. Having no throttle, a light power stroke is obtained by pushing the angular end of the push rod into contact with the nose of the cam, holding the valve E open longer, taking in more air, less mixture. Now if 2 pints containing a certain number of heat units compressed to 50 pounds compression gave an explosive force of 212 pounds, why one-eighth of 2 pints of mixture having one-eighth the heat units ought to give one-eighth the explosive force under the same compression, or over 26 pounds per square inch. But the increased oxidation, as Mr. Coffin states, would give more over 30 pounds. A single cylinder engine of this type but with a leaky piston running between 300 and 400 r.p.m. drove a lathe doing work for 7 hours, using 3 pints of gasoline and 1 pint of kerosene in an engine 3 by 8 inches, no attempt being made as to economy, no regulator or governor, but the time set of the valve E and the set of the carbureter needle valve. This engine, with a flywheel of less than 100 pounds, ran at 80 r.p.m. and drove an idle lathe, and with this low compression has burnt high and low test gasoline, benzine, alcohol, kerosene, turpentine and crude oil, one after the other, with no alteration but a slight change in the set of the carbureter, needle valve, turpentine and kerosene giving highest engine speed with a certain set of the carbureter needle valve, benzine and crude oil next, etc. In over 2 years' running there was no carbon deposit. With perfect scavenging I think this upholds my contention that the loss by heat radiation is far-fetched.

Scavenging vs. Compression

An automobile equipped wtih a six-cylinder engine of this type of engine would then run as economically as a single-cylinder, but with the smoothness of constant torque, and could crawl through the congested city streets at a snail's pace on high gear or suddenly "hit her up" with anything that "came down the pike." This type of engine with added appliances of small construction cost would enable each piston on its every upstroke to be an air compressor with a variable air release at end of stroke requiring no extra valves, a four having four compression strokes and a six having six at every revolution of the crankshaft, making a braking force that would allow a car to float down a gentle decline or come to a stop on the steepest hill without recourse to brakes.

It will be seen that this type of engine possesses superior advantages, its perfect scavenging admits of lower compression, the present type with its retention of foul gases and also throttling requiring high compression, prohibitive of good flexibility.

The motor and motoring are entering a refining period, and as the planet Neptune was discovered by a mathematical calculation, so latent possibilities of the motor may also be brought to light. It then behooves every motorist, in consideration of his pocketbook and his pleasure, to absorb all available information for comparison; to get a correct knowledge of the fundamental laws of mechanics, chemistry, etc., and to be able to differentiate between new devices of real merit and those without merit. Without having to have recourse in every instance to cut and dried methods, be able to make a criticism from your own experience, not depending on the endorsement of some scientific body whose views on some new construction are often colored by a disinclination to revise its formulas, plottings, pastimes, etc., or manufacturers who contemplate with dismay the throwing away of dollars in patterns, jigs, etc. But get an idea of what is needed and go for it. Ask questions.

As in the above-mentioned tests by Mr. Marshall, I would like to see a statement as to why some of the cars gave a lower explosive than compression pressure. Was it in the make of engine, T- or L-head, location of valves, carbureter, etc.? Car Nos. 3 and 4 being fours, what took them over compression and top dead center? Did their type produce some objectionable compound, as carbon monoxide, producing a slow combustion, a condensation of oxygen, like the well-known medical practice of cupping? Was the slow burning of longer expansion stroke giving sufficient momentum to the flywheel to overcome the shorter but higher compression stroke? Was the indicator reliable?

Brandenville, Pa. JOS. MUNDEN.

Speed Varies With Sprocket Ratio

Editor THE AUTOMOBILE:—There was started recently a dispute regarding the gearing of motor trucks as follows: All conditions were figured on 1,000 piston feet per minute for the engine. The argument was that if fifteen teeth on the driving sprocket showed a maximum speed of 15 miles per hour of the truck, would nineteen teeth in the driving sprocket show only 19 miles per hour, more or less, with no change in any other gearing and with the motor running at the same speed as given above?

Brooklyn, N. Y. R. F. ALLCUTT.

—With every other factor being equal and the teeth on the driven sprocket remaining the same, the speed of the car would vary with the teeth exactly since the speed of the car happens to be 15 miles an hour when there are fifteen teeth on the sprocket. With nineteen teeth on the sprocket the speed of the car would be 19 miles an hour at the same motor speed.

Route of the Targa-Florio

Editor THE AUTOMOBILE:—What is the course used in the Targa-Florio race? Does it encircle Sicily?

McKeesport, Pa. DRIVER.

—The accompanying map shows the course of the race, which in reality establishes a belt around the island of Sicily. While not exactly following the sea, the route often takes the tourist within sight of it and also through the larger towns.

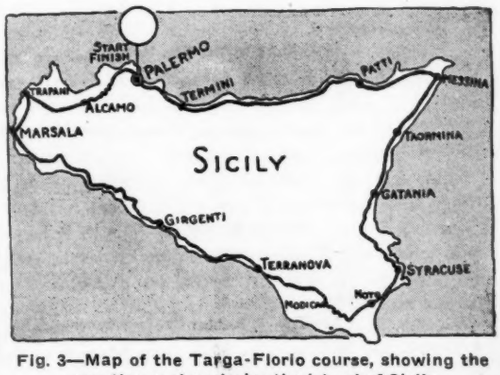


Fig. 3—Map of the Targa-Florio course, showing the way the road encircles the island of Sicily

Constant Inflation Means Long Tire Life

Contrary to the Impression Generally Prevalent, There Is No Occasion for Decreasing the Pressure in Summer

TOO much cannot be said of tire inflation. Most tires are constructed scientifically to carry certain weights under specified air pressures. Maximum service canot be had unless the tires are inflated to the exact air pressure and that specific pressure at all times. If the tires on a car require inflation to 75 pounds air pressure and only 50 pounds pressure is used, the tires are receiving one-third less backbone than needed and their life and wearing qualities are deliberately being reduced more than 33.33 per cent.

During the summer months the driver will doubtless have occasion to discuss the increase in air pressure in a tire due to its heating. The Diamond Rubber Co., Akron, O., herewith refutes the popular impression that pressures in tires should be materially decreased during the summer months.

"The absolute air pressure in any container such as a tire, the volume of which remains constant, is in direct proportion to the absolute temperature. In order to obtain the absolute pressure, add the atmospheric pressure or 14.7 pounds per square inch to the gauge pressure, and in order to obtain the absolute temperature, add 460 degrees to the temperature Fahrenheit, 460 degrees being what is known as the absolute zero.

"Applying this rule, the formula would be

$$\frac{T' \text{ plus } 460}{T \text{ plus } 460} = \frac{P' \text{ plus } 14.7}{P \text{ plus } 14.7} \text{ or}$$

$$P' = \frac{(T' \text{ plus } 460) \times (P \text{ plus } 14.7)}{T \text{ plus } 460} - 14.7$$

"Where T and T' are the initial and final temperatures, respectively, and P and P' are the initial and final pressures, respectively.

"To apply this formula to a specific case, suppose that a 34 by 4 tire, inflated to a pressure of 72 pounds per square inch, is run 25 miles in an hour under average conditions on a day when the thermometer stands at freezing, or 32 degrees Fahrenheit. The temperature will increase in a test of this kind about 35 degrees, this being determined by experiment.

"Applying the above formula T' equals 67 degrees, P equals 72 pounds per square inch and T equals 32 degrees. Therefore, the final pressure or P' equals

$$\frac{(67 \text{ plus } 460) \times (72 \text{ plus } 14.7)}{32 \text{ plus } 460} = 14.7 = 78.1 \text{ pounds per square inch.}$$

"You will note that the increase in pressure in the tire due to the heating of the tire in this specific case is 6.1 pounds per square inch.

"Again, suppose that a 34 by 4 tire is run as above, but on a day when the thermometer is at the mean temperature, or 62 degrees Fahrenheit; then the increase in temperature of the tire would be slightly less than 35 degrees, possibly 34 degrees, this being due to the greater radiation of heat by the tire at the higher atmospheric temperature.

"Applying the above formula again, the final pressure in this case would be 77.6 pounds per square inch, an increase of 5.6 pounds, due to the heating of the air. Similarly, the pressure in the tire run as above on a day when the thermometer stands at 90 degrees Fahrenheit, would increase from 72 pounds per square inch to 77.2 pounds per square inch, an increase of 5.2 per square inch.

"This information can be more readily grasped at a glance from the following table:

Atmospheric Temp. or Initial Temp. of tire	Pressure in the tire before run	Increase in Temp. due to run	Increase in pressure due to run	Final pressure
32 degrees	72 sq. in.	35 degrees	6.1 sq. in.	78.1 sq. in.
62 degrees	72 sq. in.	34 degrees	5.6 sq. in.	77.6 sq. in.
90 degrees	72 sq. in.	33 degrees	5.2 sq. in.	77.2 sq. in.

"As a matter of fact, the increases in pressure would be very slightly less than those noted above, due to a slightly greater

Air Pressures Recommended for Front and Rear Tires of Various Sizes by Several of the Leading Tire Makers

Empire Tire Co., Trenton, N. J.

Size	Front	Rear	Size	Front	Rear
2.5	45	50	4	65	75
3	50	60	4.5	75	90
3.5	60	70	5	80	100

Swinehart Tire & Rubber Co., Akron, O.

2 5	40	45	4.5	80	90
3	50	55	5	90	95
3.5	60	70	5 5	90	95
4	70	80			

Michelin Tire Co., Milltown, N. J.

3	50	60	4.5	70	80
3.5	60	70	5	70	85
4	60	75			

Fisk Rubber Co., Chicopee Falls, Mass.

3	60	65	5	75	85
3.5	60	70	5.5	80	90
4	65	80	6	85	95
4.5	70	85			

Batavia Rubber Co., Batavia, N. Y.

3	50	50	5	90	90
3.5	60	60	5.5	100	100
4	70	70	6	110	110
4.5	80	80			

Lee Tire & Rubber Co. Conshohocken, Pa.

3	50	50	4.5	80	80
3.5	60	60	5	90	90
4	70	70	5.5	100	100

Mohawk Rubber Co., Akron, O.

Size	Front	Rear	Size	Front	Rear
3	60	60	4.5	90	90
3.5	70	70	5	100	100
4	80	80	5.5	110	110

Ajax-Grieb Rubber Co., Trenton, N. J.

3	60	60	4.5	90	90
3.5	70	70	5	100	100
4	80	80	5.5	110	110

Diamond Rubber Co., Akron, O.

3	54	54	5	90	90
3.5	63	63	5.5	99	99
4	72	72	6	108	108
4.5	81	81			

Racine Rubber Co., Racine, Wis.

2.5	50	50	4	80	80
2.75	55	55	4.5	90	90
3	60	60	5	100	100
3.5	70	70	5.5	110	110

Federal Rubber Mfg. Co., Milwaukee, Wis.

2.5	50	55	4.5	75	80
3	60	65	5	80	85
3.5	65	70	5.5	85	90
4	70	75			

Goodyear Tire & Rubber Co., Akron, O.

2.5	50	50	4.5	90	90
3	60	60	5	100	100
3.5	70	70	5.5	110	110
4	80	80	6	120	120

Overloading Ruins Solid Truck Tires

Average Truck Driver Ignores Fact That Moderate Load and Speed Are the Prime Essentials of Tire Economy

THE average truck driver does not know of the dangers due to overloading and over-speeding. A solid rubber tire seems to all intents and purposes proof against injury, which fact is one of the greatest dangers. Does he know of the wear and tear on these tires caused by overloading, hard, quick braking, over-speeding, skidding, bad roads and neglected cuts? The question of attention and repairs they should receive during use is another important point to consider.

Speed is the most important of all the deteriorating influences to which tires are subjected. It has been determined that an average of 12 miles an hour, the life of a solid tire, approximates 10,000 miles, while at an average speed of 20 miles an hour it would be a candidate for the scrap heap at the end of about 4,000 miles.

The B. F. Goodrich Company, Akron, Ohio, says that the dangerous effect of overloading cannot be ovverestimated. Tires are constructed to carry certain loads which, if exceeded, will result in premature failure of the tire unit. Rubber compressed beyond its safe limit of elasticity will break down just as any other material will do.

The Goodyear Tire & Rubber Company, Akron, Ohio, says that skidding, starting and stopping, tractive effort, are in the nature of natural causes of wear. In truth, are causes of ordinary abrasion under practically normal conditions. Habitually running in car tracks has its invariable ill result in a similar manner. For the edge of the tire, the small portion which runs on the rail is carrying the load intended for the whole tire. A further shearing effect is produced, too, that is most injurious to the tire's fastening.

An improvement has been made upon the Motz cushion tire. This tire is constructed with undercut sides which form slant-wise bridges. These undercut sides, in the old tire, were diamond shaped, forming sharp corners that were inclined sometimes to continue their course and crack when they became filled with dirt or small stones. However, this had no bearing on the service obtained under the guaranteed mileage. The corners have been rounded and at the same time the indentations have been constructed with a concave base which forces the dirt out immediately upon its entrance.

The solid tire is essentially a low-speed tire, says the United States Tire Company, New York City, and when a pace faster than from 15 to 18 miles an hour is maintained the tires are bound to suffer. In the first place, excessive speed generates extreme frictional heat which in turn produces disintegration. Either the rubber tread will separate from its semi-hard rubber base or the whole tire will become loosened from the steel foundation, rendering it practically worthless.

Solid tires are designed by the manufacturer to carry a certain weight and when the specified limit for each tire is exceeded it is a case of overloading. The effect of this is to break down the tire completely. In a majority of cases it will separate from the steel base. The following tables of weights for single and dual tires are recommended by two of the leading tire companies:

B. F. Goodrich Co., Akron, O.

Wheel	Single	Dual	Wheel	Single	Dual
3	590	2,500	5	2,000	6,000
3.5	1,375	3,500	6	3,000	8,000
4	1,750	5,000	7	4,000	10,000

United States Tire Co., New York City

2.5	650	1,400	5	2,000	6,000
3	950	2,500	6	3,000	8,000
3.5	1,375	3,500	7	4,000	10,000
4	1.750	5,000			

expansion of the tire itself caused by the greater pressures.

"The point of this whole discussion is that the increase in pressure, due to the heating of the tire, is not nearly so great as is commonly supposed, but for a given run is less on a hot day than on a cold day.

"Of course, this heating of a tire is injurious to it, but whenever the pressure in a tire is decreased, the heating of the tire is increased, rather than decreased, on account of the greater bending of the tire and consequent greater friction and generation of heat.

"From the above it should be clear that the pressure in a tire should not be decreased on a hot day as is commonly supposed, for the simple reason that it is impossible to obtain an increase in the pressure, due to the heating of the tire in service, sufficiently to in any way injure it."

The Racine Rubber Co., Racine, Wis., says that "at least 75 per cent. of the tires in use are ruined directly or indirectly through lack of proper inflation. A tire is built to the exact shape it should assume when put into service, and inflated to the proper pressure, but when this pressure is not observed the tire is constantly running under an unnatural strain, which, in a short time, causes the fabric to crack, due to the excessive flexing caused by under-inflation.

"A great many car owners do not observe proper tire pressures until after they have weakened the inner walls of the tire through under-inflation, and then when the tire is properly inflated it gives out, due to the weakened condition of the fabric, which would not have happened if the proper pressure had been kept in the tire at all times. This naturally leads the car owner to believe that this tire gave satisfactory service when used with insufficient air pressure, but immediately gave out when he followed the advice of the tire manufacturers."

Inflation above that for which the tire was designed is as great an evil as under-inflation, for the fabric and the rubber are both strained. Flexibility is also sacrificed by having the tire blown up to an undue pressure, and the tire becomes no better than a solid type so far as its ability to absorb road irregularities is concerned. Then, too, when the tire is over-inflated the engine, and, in fact, the whole mechanism of the car, is subjected to road jars which will make depreciation due to the use of excessively hard tires very great. Consider, then, the greatly increased racking of the higher speed and frailer pleasure vehicle.

Those who wish to secure a long mileage from their tires should be sure and not guess at the tire pressure, by feeling or kicking the tires; they should carry a gauge or some instrument by which the exact pressure may be obtained. Those using the tires mentioned in the table on page 1316 will be benefited by observing the tabulation given, which shows the proper pressures on the different sized tires for both front and rear wheels. It will mean dollars in their pockets.

Welfare Work Raises Goodyear Efficiency

Company Finds That Helping Workmen Brings Results

IN the modern factory, the welfare of the employees is looked upon with as much concern as is the actual making of the product, for it does not take a very far-sighted employer to realize that the men who do the actual work are a contributing factor to the success of any institution. Fair treatment and a man-to-man attitude are necessary to co-operation and for the benefit of all. The employer who puts the problem of production squarely up to his men and who affords them decent working conditions gets results. He appeals to their intelligence and shows them why he does certain things in certain ways; he provides them with light and air in his shops; affords them opportunities for recreation; looks to their welfare; and they in turn give him the best there is in them. It is a family spirit, and one which has helped to put more than one great industrial institution where it is today.

Each factory has its own methods of providing for the welfare of its men. Different localities and different kinds of manufacturing bring up different conditions. Some classes of machinery, for instance, are much more dangerous to life and limb than are others and require more elaborate safety devices such as guards, quick-stopping apparatus and the like. Then too, differences in the construction of buildings bring up problems of ventilation and sanitation that are variable. These are a feature of present-day factory operation which each organization must work out for itself.

Many factories where large numbers are employed have definite policies for the promotion of every conceivable scheme for the betterment of working conditions. In the Goodyear Tire & Rubber Company's plant at Akron, for example, there is a department of efficiency and welfare in charge of experts in this line which makes a continual study of the factory conditions and looks to the constant linking of the interests of worker and employer without sacrificing the efficiency of either.

The policy of this great rubber factory which employs about 6,000 men and women is best shown by a statement taken from a guide book given to all new employees:

Our Policy—We consider that our employees as a body are a contributing factor in our success, and our policy is, fair treatment for all and special privilege to none. We ask you on your part to contribute your share towards the mutual well-being of the company and your fellow employees. We ask you to respect the place in which you work, to maintain neatness, cleanliness and cheerfulness, and to be real American men and American women.

This attitude prevails throughout the whole of the concern's 2,000,000 square feet of manufacturing floor-space, and can safely be said to have aided materially in developing a rubber business which is today in the foremost ranks.

On Look-Out for Weaknesses

Features chargeable to the efficiency and welfare department of the Goodyear plant are noticeable everywhere in the buildings. It co-operates with the factory manager and the manufacturing department. Its heads are continually looking for weaknesses. Should it be noticed that a certain machine is not as well provided with safety features as it might be, others are added. If it is found that a particular process can be carried out with fewer motions, the more efficient method is adopted, and so on.

The workmen are encouraged to make suggestions for the betterment of any part of the factory, or any operation, or any machine. When such suggestions are deemed meritorious and are adopted, the employe originating the idea is given a money prize in proportion to the value of the suggestion. These prizes are a standing offer, and little boxes are fastened to the walls in various parts of the factory in which to drop notes and sketches dealing with the suggestions. The boxes are visited regularly and the ideas offered are given careful consideration. Besides, the employees thus have a means of communicating any alleged wrongs direct to the heads. The scheme has worked very well, and has been the means of effecting several valuable improvements in machinery, and in the plants as a whole. For a certain attachment to one of the machines which eliminated one hand operation, one man not long ago was presented with $100 and a promotion.

The Goodyear Company maintains a fully-equipped emergency hospital off in a quiet wing of one of the buildings. This is in charge of an able physician and surgeon paid by the company, who does nothing but its work. In addition, trained nurses are employed day and night. THE AUTOMOBILE representative was given an opportunity to inspect this feature of the plant, which is a model of its kind. Kept in immaculate condition, this hospital has the most modern of surgical equipment. It includes an operating room where the most difficult of emergency operations may be performed.

In addition, there is a sick ward containing half a dozen beds where injured men may be quartered for any necessary length of time under the best of care. There is also a similarly-conducted women's ward. Although accidents are carefully guarded against, nevertheless, they will sometimes occur, and this one feature of the welfare work has many times helped sick or injured men to quick recovery who at their homes would not get proper care. The company assumes no responsibility for the consequences of injuries not immediately reported at the hospital.

Directions Well Posted

Everywhere throughout the factory buildings, signs and arrows are posted directing to the hospital by the shortest route, so that in case of an accident, no time will be lost in reaching the doctor and his assistants. These signs are simply small metal affairs with the arrow and the words "to hospital" on them. They remind one of the signs along the highway directing to the different towns. Each corridor, hallway and turn is thus placarded every few feet.

The restaurant or lunch room is also an important feature. It is located on the top floor at the end of one of the main buildings, and serves four meals each day. Breakfast is provided from 5.30 to 7 a. m., noon lunch from 11.30 to 12.30, supper from 5 to 6 p. m., and midnight lunch for the night force from 11.30 to 12 p. m. The lunch room is not operated for profit, but aims to work on a cost basis, so that a workman can get a very good meal for an exceedingly small outlay.

It is, of course, next to impossible to fix up the prices so that

Type of cottage which the Goodyear company is building to furnish its workmen and their families

the restaurant will run exactly even, so that whenever the financial report issued every four months, shows a profit or a deficit, the prices are reduced or increased slightly to overcome the difference. For the four months ending March 1, a deficit of $1,939.39 was shown, and the price was therefore slightly raised to cover the loss. For the previous quarter year a profit had been shown which had resulted in perhaps too great a reduction.

Last April another idea which had been contemplated for some time by the Goodyear Company was matured. "Hotel Goodyear" was opened to accommodate new employees of the company, affording them temporary quarters until they could find permanent residences in the city. A building adjoining the plant was purchased and the upper floor fitted up for living purposes.

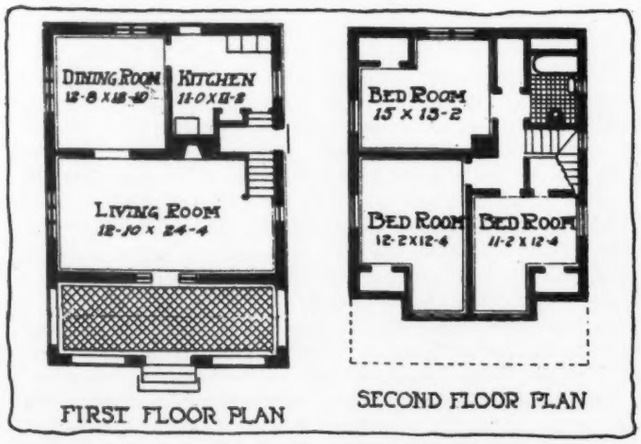
Partitions were erected dividing the space off into four large rooms and some smaller ones. Three of these rooms are used as sleeping rooms, while the fourth is set aside for a reading room, where magazines and newspapers are furnished. Here the men may spend their spare time if they wish. Two of the sleeping rooms will hold fourteen men each while the third has room for twelve, so that the "hotel" offers accommodations for forty men. There are shower baths, and each man is provided with a locker. Beds, bed clothing and the like are furnished by the company. The sleeping rooms are kept quiet at all times, for the accommodation of both night and day men.

As the hotel is intended primarily to afford a cheap and comfortable living place for newcomers, they are expected to find a permanent location in the city as soon as possible so as to make room for later arrivals. To aid them, the employment office keeps a record of all rooming houses, so that it should not take a man over a week to become located. With this end in view, a nominal sliding scale of prices for lodging at the hotel has been fixed. Thus, 15 cents a day is charged for the first two weeks, 20 cents for the next week and 25 cents thereafter.

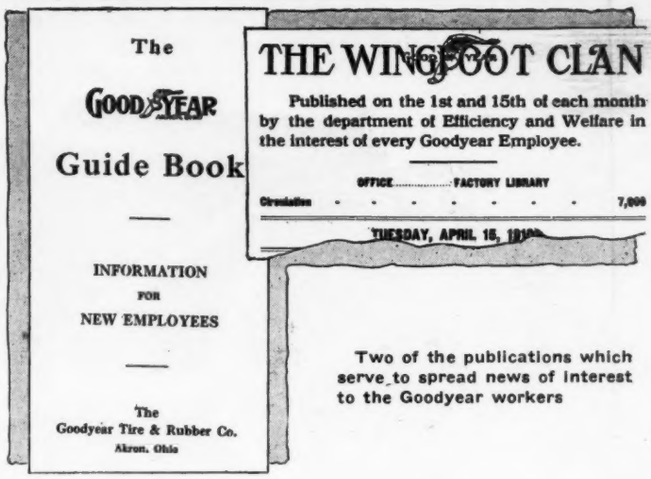
The hotel so far has proven an immense success, and the men have eagerly taken to the idea. The accommodations afforded are really better and cheaper than they could find elsewhere, and it is sometimes a hard matter to get the men to move after they have been there for some time, in order to make room for others.

Another plan for the benefit of the Goodyear employees must not be overlooked here. This is a scheme for allowing the workers to purchase attractive homes from the company. A large tract of land across the street from the factory and in a beautiful hilly section with a commanding view of the town has been purchased by the Goodyear interests and is now being divided off into streets. Water mains and sewers are being put in. In fact, all the streets in the section where the first hundred houses are to be built have been graded and are ready for building operations.

The company is to divide this property off into lots, and on each an attractive house is to be built. Each will be individual and unlike the rest. Mann & MacNellie, architects, of New York, have been engaged to draw up attractive bungalow and small house plans which will be followed in the Goodyear allotment. The company is to sell these houses on large lots to its employees at cost and on very long easy terms besides. Only a few hundred dollars will have to be paid down, and any man can own his own home in from twelve to fifteen years.



Plans of first and second floors of the cottages being erected for workers in the Goodyear plants


The
GOODYEAR
Guide Book
INFORMATION
FOR
NEW EMPLOYEES
The
Goodyear Tire & Rubber Co.
Akron, Ohio
THE WINGFOOT CLAN
Published on the 1st and 15th of each month by the department of Efficiency and Welfare in the interest of every Goodyear Employee.
OFFICE ..... FACTORY LIBRARY
Circulation - - - - - - - 7,000
TUESDAY, APRIL 15, 1913

Two of the publications which serve to spread news of interest to the Goodyear workers

Free Factory Library

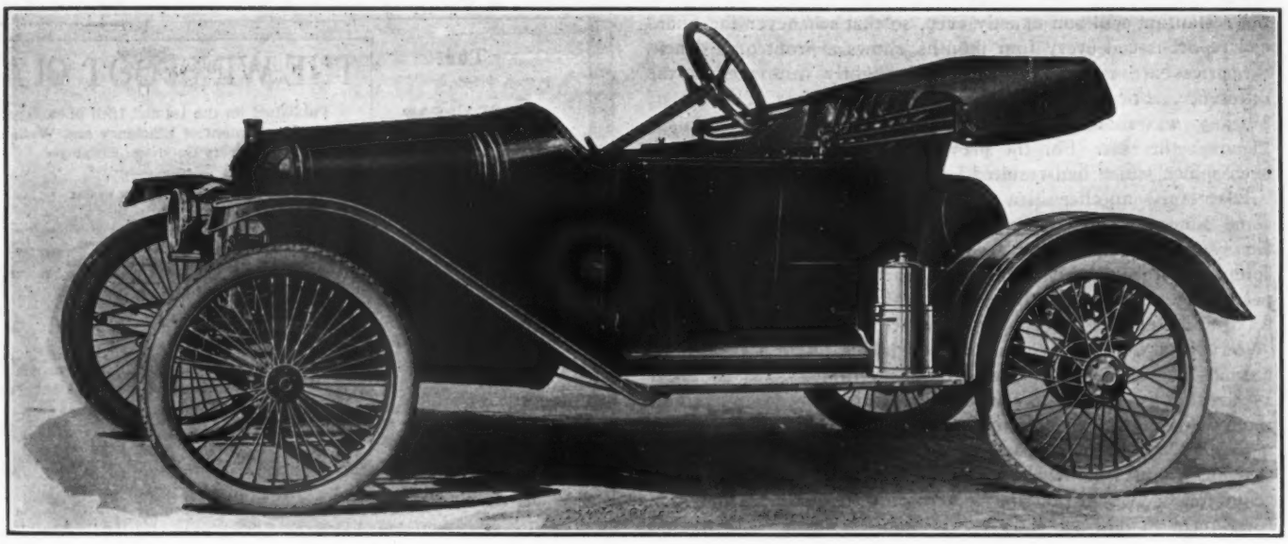
The Goodyear Company encourages organizations and activities which will benefit the employees. There is a gun club, baseball team, swimming team and so on. These afford recreation and are body builders which are looked upon as features not only desirable but necessary.

There is a strongly organized relief association at the factory, which pays a sick and accident benefit of $5 per week, and in the case of death of a member pays $1 from each of the other members. The initiation fee is $1 while the monthly dues are the nominal sum of 25 cents. At the present time, the association has about 1,000 members, so that, for $3 a year, each has protection against accident, and carries about $1,000 worth of life insurance. Having once joined this association, any Goodyear employee can still keep up his membership even though he severs his connection with the company, provided he does not go outside of Summit County.

Then too, there is the factory newspaper, "The Wingfoot Clan," which is published on the first and the fifteenth of each month by the Department of Efficiency and Welfare in the interest of every Goodyear employee. This little 4-page sheet is brim full of news of the doings of the men who make the Goodyear products. It tells of the progress of the allotment, gives interesting accounts of doings among the different organizations, chronicles the results of the games played by the various teams, and, in short, acts as a medium for communication between the factory heads and the men. Whenever a new order is issued, it tells the reasons attached thereto. It keeps the men posted on the doings of the Goodyear family, so to speak. It has a circulation of 7,000 copies.

On the same floor with the lunch room, there is a factory library where the men are free to come to look over a representative array of technical works of all kinds, technical journals and the like. There are reading tables and the other appointments of a well-equipped library. Here the men may also come to write in their spare hours, if they wish. The factory newspaper office is located in this library.

Another feature of note is the Goodyear guide book, a copy of which is given to each man when he enters the employ of the company. It gives information as to the systems in vogue at the plant, directions for reporting time, and tells of all factory features so that the newcomer will the more easily get acquainted with the plant and feel at home.



Side view of the new Grant car that is just one size larger than a cyclecar

New Grant Car a Real Miniature Automobile

New Small Car Embodies Four-Cylinder Motor, Cone Clutch and Has Regular Shaft Drive

DETROIT is getting used to seeing unique self-propelled vehicles on its streets these days, for with the coming of the small car movement in this country, the majority of the designers of such types decided upon the automobile city as the logical place of promotion. Abroad, much interest attaches to the development of various kinds of cyclecars, but it would seem that in America, these vehicles are destined to give way to other small vehicles which are really miniatures of the standard motor car.

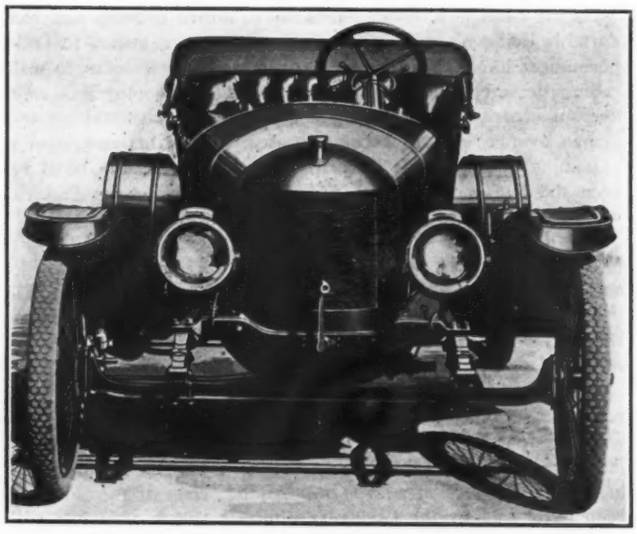
The American public demands a little more in such a car than do the English or the French who are content with small belt- or chain-driven affairs of very light weight and extremely low cost. Expensive differentials and the like are eliminated in these cyclecars, but it is doubtful if they will ever be popular in America without some changes which will make them adaptable to our rougher roads and consequent greater strain on the various parts.

No fewer than half a dozen Detroit designers are working with this idea in mind and are testing out variously constructed miniature automobiles to the edification of Detroiters.

The first evidence of this movement was the appearance of the Grant car, made by the Grant Motor Co., so named from the fact that the Grant brothers, well known automobile men of Detroit, are heavily interested in the concern.

The little newcomer is a real machine in every way. It has a four-cylinder motor, driving through a cone clutch and propeller shaft to a two speed gearbox mounted in unit with a rear axle having a gear differential and bevel driving gears. In appearance the Grant car resembles a number of the smaller of the European cars. It has a stream line body; wire wheels carrying motorcycle tires, size 28 by 3 inches; and a wheelbase of 90 inches.

The motor is an L-head and has a bore of 2 3-4 inches and a stroke of 4 inches with cylinders and crankcase cast in one piece,



Front view of the new Grant car, showing radiator

thus making for simple production. The horsepower is given at 16 on the block at a speed of 1,600 revolutions per minute. The crankshaft is carried on two main bearings, the rear bearing being carried in an end plate which covers a hole through which the crankshaft may be removed. Although the crankcase is all one piece, it is easy to inspect the connecting-rod bearings through a long plate bolted to the bottom of the crankcase.

The manifold construction is also a simplification of general motor practice. Referring to the view of the engine herewith, it will be seen that all manifolds are cast integral with the cylinder casting. The inlet manifold connection is below the flanged exhaust duct on the right side. Still lower is a cover plate, the removal of which gives access to the valve mechanism. The location of the inlet manifold below the exhaust makes it possible for the gas to be heated by the exhaust before it enters the cylinders. The valves of the regular poppet type, have a diameter of 1 5-16 inch and their lift is 5-16 inch.

On the right side are also the Mayer carbureter and the Bosch magneto, the former being at the back while the magneto sits forward, so that there is no congested condition of these two necessaries. Timing gears are located forward and enclosed in the usual way. As an aid to silence they are helically cut instead of being of the straight spur type. From the magneto shaft, the fan is driven through pulleys and belt. Adjustment of the belt

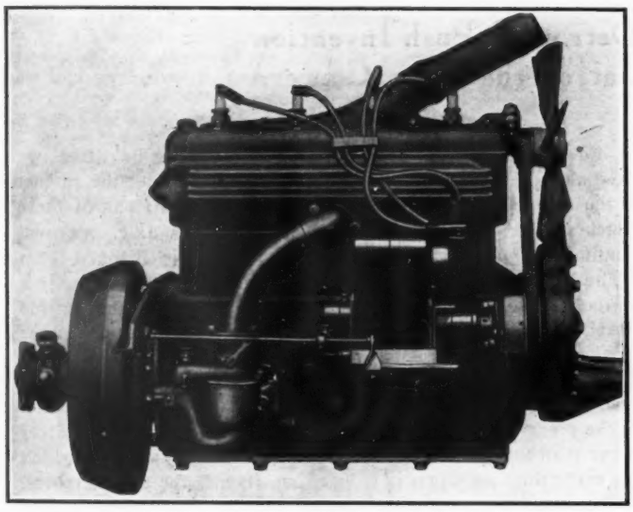
tension is accomplished through a take-up bracket and integral with the top plate.

Of special note in connection with this specially designed small motor is the plate at the top which forms the cylinder heads. This is removable by the taking out of fourteen bolts and it carries the spark plugs, priming cocks and water outlet connection.

Cooling is by thermo-syphon which lessens weight by eliminating a water pump. The radiator is of the rounded type as seen in the chassis view. It is of tubular construction, and the rounded effect is in keeping with the general stream line appearance of the whole.

Lubrication is by the splash system, the oil being carried in a 2-quart reservoir, in addition to which there is a vacuum oiler mounted on the left side of the motor and having a capacity of 2 quarts which makes up for any deficiency in the splash when the motor is running.

Back of the motor the power is transferred through a cone clutch to a propeller shaft fitted with a ball joint at its forward end and enclosed in a torsion tube. The change-gear set which affords two speeds forward and a reverse is in unit with the rear axle. The latter is three-quarter floating and carries two sets of brakes. These are the accepted internal and external expanding variety and the drums have a diameter of 7 1-2 inches, while their width is 1 1-2 inches. Radius rods run from the forward end of the torsion tube back to the ends of the axle as a further bracing feature. The gear ratio is 4 1-2 to 1 on high.



The Grant car uses a four-cylinder block motor

As to the spring suspension, there is a single half-elliptic cross spring in the rear which supports the frame rear cross piece at its center. The front springs are elliptic, 26 inches in length, while the rear are 47 1-2 inches long.

The drive is on the left side, while the control levers are in the center. There is ample room in the little machine for two persons. The weight is about 1,000 pounds in marketable condition, and the maximum speed possible with it is 50 miles an hour according to the makers. The gasoline tank is carried under the cowl and has a capacity of 6 gallons.

As would be expected, very high mileage is obtained from the fuel. On the average, from 30 to 35 miles are expected of every gallon. The car has made several test runs with a very economical showing in this respect. In a recent 200-mile run of 8 3-4 hours duration, the mileage per gallon was 25, while another test was made from Detroit to Pontiac, Mich., and return —a distance of 58 miles over fairly good roads with a few hills, this time the car requiring 1 1-2 gallons of fuel.

The price has been set at $495 with full equipment.

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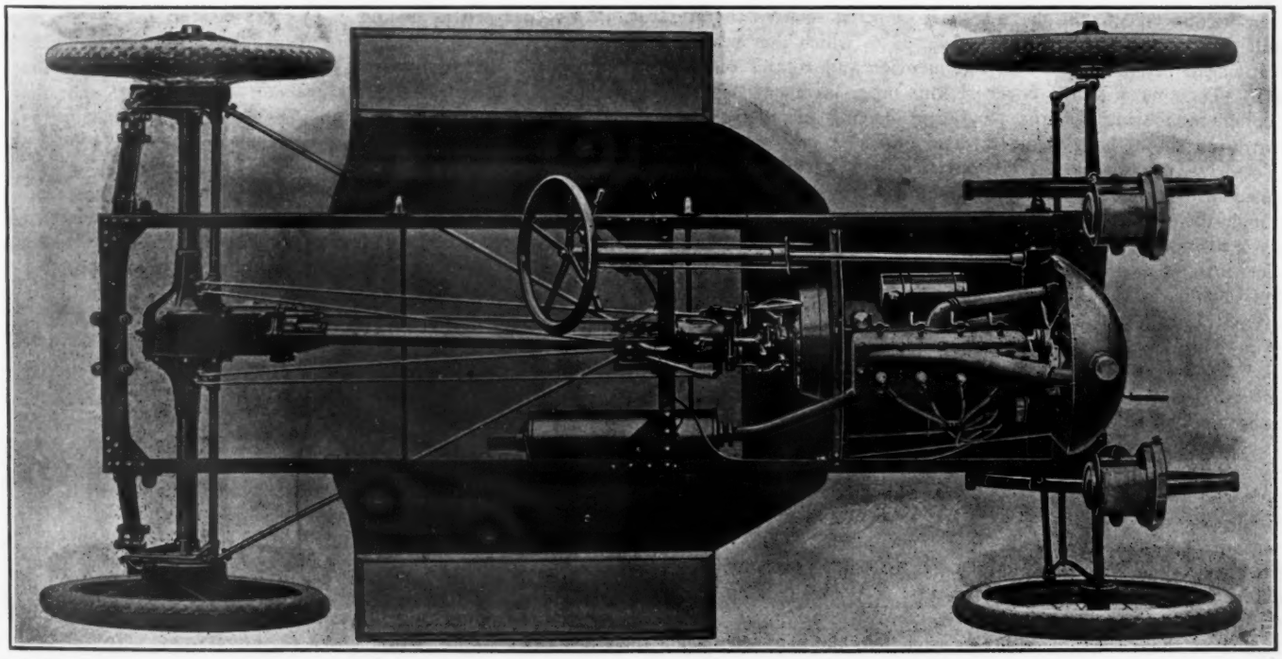
Keep Garage Entrances Clear

One case of nuisance which often results in considerable loss of time on the part of automobilists is the blocking of garage entrances by other cars. As most places of this kind are fitted with but one entrance, such a state of things results in distinct waste of time for all who want to pass through the door. In large cities, where many cars pass through the garage doors in rapid sequence, it would pay for most any garage to keep the doorman watching for this and let him make any car blocking the entrance clear out of the way. It is one of the most disagreeable feelings to sit behind a motor and to hold the clutch out, merely because someone is in the way, especially if the blockade is not necessary. Undoubtedly, there are quite a number of cases in such a city as New York, where people have dropped a garage and taken up another on account of delays.



Plan view of the chassis, showing motor mounting and arrangement of drive

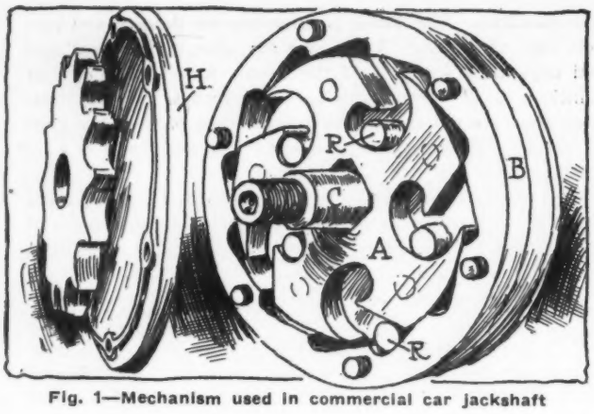


Fig. 1—Mechanism used in commercial car jackshaft

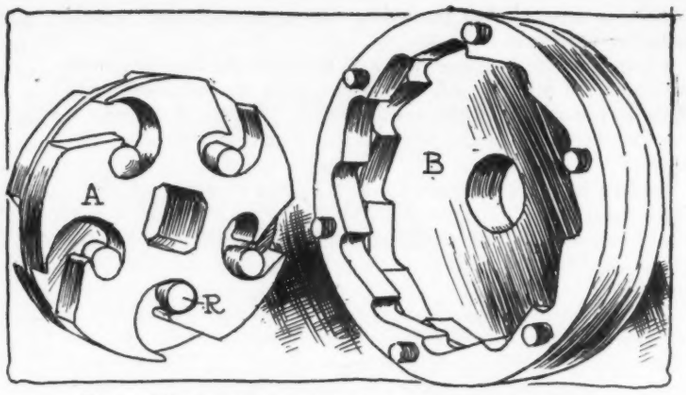


Fig. 2—Showing two rows of teeth for ratchet and pawl

Gearless Differential Latest on the Market

Gearless Differential Co. of Detroit to Push Invention of George D. Bailey, President of the New Concern

REALIZING that the conventional gear differential is by no means a perfect mechanism for the transfer of power from the motor to the rear wheels, it has been the target of inventors ever since the motor vehicle has been perfected, so to speak. Devices of all kinds have been brought out to overcome the weak points of the differential and at the same time to perform the function for which it is intended, namely, to automatically apportion the tractive effort of each driving wheel in relation to its road resistance, and to compensate for the differences in speed of the outer and inner wheels in turning.

The Gearless Differential Co., Detroit, has been organized to promote a special form of releasing clutch differential which is the invention of George D. Bailey, president of the concern.

This device is really an overrunning clutch and gears are conspicuous by their absence. Fig. 1 shows the construction of the mechanism as it is mounted inside of the sprocket of a commercial car jackshaft. The outside cover is here removed disclosing the pawl cam A and ratchet B. The pawl cam is directly connected to the driving shaft C, being squared thereto, while the ratchet is bolted to the cover H to which the sprocket is attached. It is thus the driven member and rotates on the shaft. Together with the cover H, this outer member B forms a complete housing for the pawl cam driving member. The illustration shows both members dismounted.

To drive the sprocket, it is obvious that there must be a connection between the members A and B. This is accomplished through the rollers R. In the illustration the cam A has engaged the ratchet B through the intermediary of the lower roller, turning the sprocket, and, considering that it is the right hand clutch, driving the car forward. As long as the car is driven straight ahead, this roller will keep this position.

Now consider that the driver shifts his gears so that the propeller shaft reverses its drive. The axle shaft and the connected pawl cam A start to move in the reverse or counter clockwise direction. The roller which up to now has been engaged is released and immediately scooped up by the arm of the pawl cam, breaking the connection. This roller, together with the other four, are then carried toward the center in the runways by their own inertia.

But the opposite side of the pawl cam is the reverse in its form from the side shown, as indicated in Fig. 1, and when the pawl cam moves in the opposite direction, the rollers on this side are thrown outward from its center by centrifugal force and one of them engages with the ratchet in the same manner as did the forward drive roller, the engagement of which we have already seen. Thus the connection for turning the ratchet in the reverse direction is made. As there are two sets of these clutches, one on either end of a jackshaft or axle, both act simultaneously when the direction of rotation is changed.

The action of the clutches is thus clear for straight motion of the vehicle forward or back. In making a turn, the outside wheel, describing the greater circle, moves faster than the other and hence propels the clutch ratchet to which it is interconnected at a correspondingly faster speed. Since the inner member or pawl cam cannot revolve faster than the slower moving ratchet of the pivot wheel, its ratchet (that of the outer wheel) revolves faster than this outer wheel driving member and the roller which has made the connection is scooped up, freeing the two members.

The peculiar construction of the runways and sockets causes the rollers to be hold out of, or let into, engagement at the proper time only, so that there is no possibility of any roller, which engages on reverse drive, reaching the ratchet so as to interrupt its increased speed in making a turn on forward drive or vice versa. In the type shown here, which has five runways and which is adaptable for cars up to 3-ton capacity, one end of the axleshaft is squared 36 degrees ahead of the other, so that the forward and reverse runways in one pawl-cam become operative intermediate, relative to the corresponding runways in the other. Thus, in starting forward or backward, a roller in one clutch or the other is always ready for immediate engagement.

Several logical advantages over differential gearing are claimed for the device. Since there is no possibility of one wheel alone spinning while in a rut or on soft ground, the elimination of this undue slippage is a factor in tire economy. No lubricant is required within the clutch mechanism, as any grease or oil would tend to cause sticking of the rollers, preventing their proper action in the runways. There is no wear between the driving parts as there is no sliding or rolling contact. Stalling of the motor, skidding when brakes are suddenly applied, and side slewing are also reduced to the minimum necessarily. It is also claimed that an axle embodying the releasing clutch costs less to manufacture than does a rear unit equipped with the conventional form of differential.

This new type of differential has passed the experimental stage, we are told by the makers, and is even now being used by three car manufacturers as standard equipment, while half a dozen other prominent makers are experimenting with it on their test cars.

Cycle-Truck the Newest in the Commercial Field

Harley-Davidson Company Announces Two-Speed Vehicle with a Nominally-Rated Carrying Capacity of 600 Pounds

FOR several years the Harley-Davidson Motor Co., Milwaukee, Wis., manufacturer of motorcycles, has been experimenting with various types of light delivery vehicles, the result of this work being the introduction of a light three-wheeled delivery truck driven by a two-cylinder motor. The truck is designed to carry 600 pounds in addition to the driver, and has an overload capacity of again as much. The tread is standard, 56 inches, and the wheelbase is 76 inches. The standard body is 2 feet 10 inches wide, 3 feet 6 inches long and 2 feet 4 inches high, with the doors opening in front. This truck handles easily in congested traffic and under all kinds of road conditions. It is equipped with the Harley-Davidson two-speed gear, which gives a ratio of 5 to 1 on high speeds and a ratio of 10 to 1 on low speeds.

With a maximum load the truck can be started easily in mud or snow and on heavy grades. In light fluffy snow less than 6 inches deep it was possible to attain speeds of considerably better than 25 miles an hour with a maximum load. The slush and mud of last spring and of a year ago did not interfere with its use every day.

The value of this feature cannot be overstated: In many states it is against the law for a chauffeur to leave his motor running when he leaves the car. To expect the driver of a truck to crank his automobile 150 or more times a day—depending upon the number of deliveries made—is, of course, out of the question. As a result, in motor truck delivery it is necessary to have two men where many stops are made.

Power transmission is through a Harley clutch, the gears being always in mesh though they are not running except when low gear is being used. The gear-shifting mechanism is directly in front of the saddle and above the clutch lever, as shown in the illustration.

The braking is done with either pedal. In addition to the advantage incorporated in this feature, the driver has an additional brake pedal easily convenient to his right foot.

The brake can be locked in any position, a necessary convenience when the motorcycle truck is stopped on a hill. The brake is 7 inches in diameter with a face .875 inch wide. Well-designed mudguards protect the driver so this truck can be used irrespective of weather conditions.

The chassis is constructed of pressed steel with cross braces under the body and side stays to the frame head, and rear wheel, so that the strains of the load are evenly distributed. The chassis follows generally the practices of automobile design and construction. The steering knuckles have ball bearings at the top and bottom.

The truck is equipped with 28-inch wheels, each of which has forty heavy spokes and large hubs especially designed and constructed for this work.

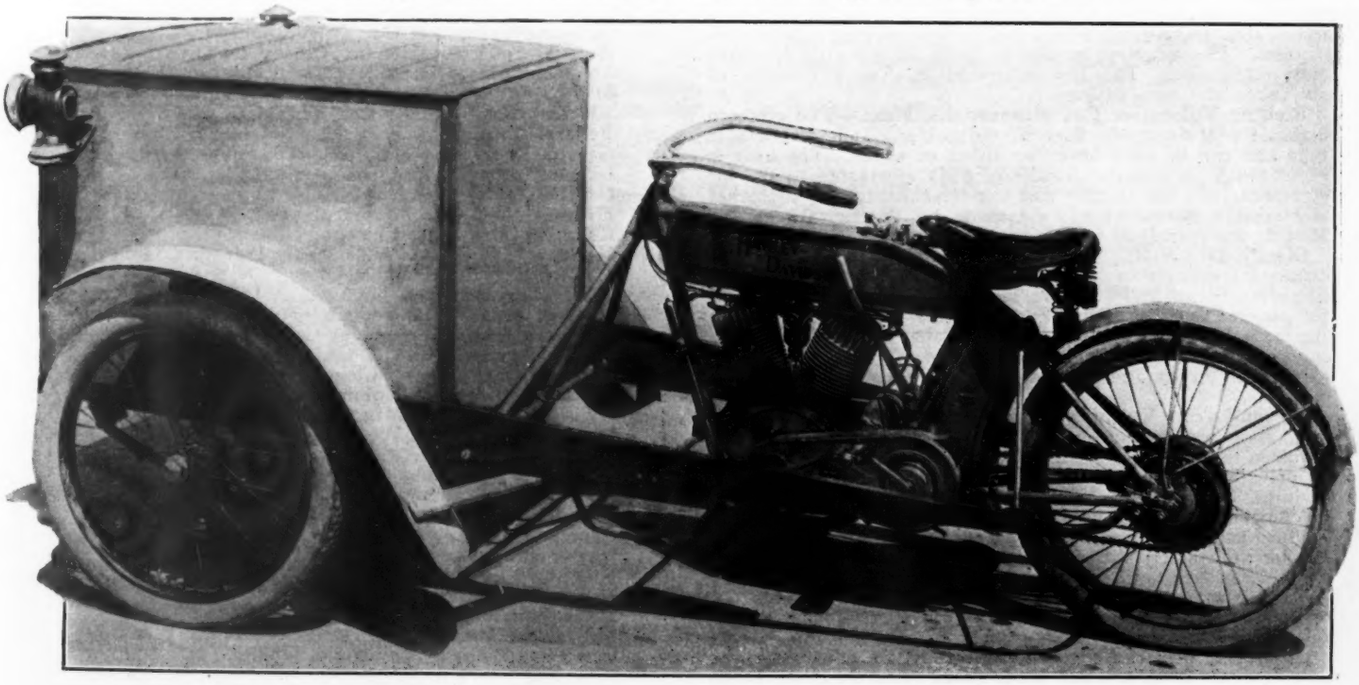
Three-inch tires are used on all three wheels. A low center of gravity is obtained with the underslung construction and sufficient clearance is provided for even the deep snows prevalent in Wisconsin in January and February. The load in the body of the car is carried on semi-elliptic springs 1.75 inches wide. Hardened steel bushings and pins are used in the shackles.

In a test by D. C. Owen, postmaster of Milwaukee, on a route of 14.2 miles, 4.5 hours were required as the average length of time when deliveries were made with a horse and wagon, whereas the motorcycle truck made fifty-three stops in 2.5 hours. The regular parcel post man was carried on the box on this test, although in actual service, of course, this additional weight would not have to be carried.

The motorcycle trucks now in service have demonstrated that, when used for long runs, they make from 40 to 45 miles per gallon of gasoline. The gasoline consumption in the demonstration given for the benefit of the postoffice officials of Milwaukee was a trifle less than half a gallon. Figured at that rate, and with an oil consumption of 250 miles per gallon, it can be readily seen that the operating cost of a motorcycle truck is about 60 cents a day for a 10-hour day, covering 75 miles daily.

The makers state that with a motorcycle truck one man can do the work of two men with two horses and two wagons.

At the request of the government, one of these motorcycle trucks has been sent to Washington for inspection by the postal department. This particular truck has a body built in accordance with the suggestions of postal officials.



Three-wheeled two-speed cycle-truck brought out by the Harley-Davidson Company for light delivery work

Vulcanizers Reduce Tire Expense

VULCANIZING, within the last few years has dropped from the level of a rather obscure science to the point where any owner of a car can do satisfactory work for himself or have excellent work done in a shop. With any one of the devices listed below a man can make a good job of a tube or casing repair and instead of having a more or less temporary cure of his trouble, he can be sure that he has accomplished a permanent piece of work.

It takes but little longer to vulcanize a tube than it does to patch it. A good vulcanizing job on a tube can be done in 20 minutes. In fact, it is undesirable to prolong it beyond this. The vulcanizing of a casing cut takes longer, an hour generally being allowed for the work.

There are two necessities for making a good job in vulcanizing; the first is cleanliness and the second a good grade of raw rubber. As in soldering work with metal, no good results can be hoped for unless every vestige of grease or dirt is removed from the surface. The proper material for cleansing the rubber is gasoline which cuts the dirt and even penetrates the pores of the rubber.

Cuts in casings can be healed permanently and well with the vulcanizing process. Water enters the smallest cuts and reaches the fabric and starts a rapid rotting process which soon weakens the tire to such an extent that a blowout occurs. Tires can be made to last twice as long if the small surface cuts are cared for.

Adamson Manufacturing Co., East Palestine, O.—The Adamson vulcanizer can be carried in the car and can be used on inner tube repair work by simply drawing off gasoline from the tank filling the vulcanizer and applying it to the tube. The heat from the gasoline vulcanizers the crude rubber patch to the tube. By use of the outfit the casing repairs can also be vulcanized.

Biggs Boiler Works Co., Akron, O.—The Biggs Co. does not make portable vulcanizers nor does it make inner tube vulcanizers. It confines itself to large vulcanizers for manufacturing purposes and retreading. The Biggs vulvanizers are of the steam type. In addition to the vulcanizers a large rotary devulcanizer is manufactured.

Diamond Manufacturing Co., Des Moines, Iowa—The Diamond Co. makes the Allen vulcanizers. These are made in five styles, and are all of the steam type, having smoke consumers. The smallest, model A, has a capacity of one tube and one casing. The largest, model E, has a capacity of six tubes and two casings.

Electric Vulcanizer Co., Minneapolis, Minn.—The concern makes the Minneapolis Electric vulcanizer. It is of portable type and can be used on either tubes or shoes. The heat is regulated by a rheostat handle directly connected to the instrument. On the smaller size the attachments are such that any repairs necessary can be made by the private owner. Moulds are furnished to fit any size tires.

Gibney Tire & Rubber Co., Philadelphia, Pa.—Gibney vulcanizers are made in four styles, known as the Eleck-Trick, Rheostat, Steam and Multiple-Tube. The first three are used for general repair work and are portable. The leader of the line is the Eleck-Trick. It is of nickel-plated cast steel and has a concealed electric coil for heating. It is of great convenience to the car owner and can be used on either 110 or 220-volt circuits.

Gwynn-Bacon Vulcanizer Co., St. Louis, Mo.—This concern manufactures automatic electric vulcanizers. The time required for work with these instruments which are adaptable to private use is 20 minutes for a tube and 1 hour for a casing. The concern manufactures both large and small vulcanizers, the large having a capacity of four tubes.

The Leader Manufacturing Co., Inc., Cleveland, Ohio—The Leader vulcanizers differ from all others in that they carry a novel gasoline torch steam generating outfit which produces its own blast and is incidentally adjustable. It is made for private use and will handle anything from a motorcycle type to the largest automobile tires.

Charles E. Miller, Anderson, Ind.—Miller's vulcanizers are of the steam type, and are made in all sizes from the large garage or tire repair plant apparatus down to the small equipment for the private garage. A full line of adjustable sectional vulcanizers are made in five sizes.

The National Motor Supply Co., Cleveland, Ohio—National vulcanizers are of the steam and gasoline types. The steam vulcanizers are made in larger sizes for garage use while the smaller or portable types number two. The first, known as the National, is for small garages and is of the steam type. The second, known as the Mascot, is a gasoline burner which is clamped directly on the tube and utilizes the heat of combustion of the gasoline.

C. A. Shaler Co., Waupun, Wis.—This concern makes the Vul-Kit. It is an apparatus for repairing inner tube punctures only and is carried by many motorists in place of an inadequate patch fit. In addition to this there are three other portable outfits, types B and D being electric, type S steam; type NPR is a complete garage equipment repairing all kinds of tube and casing injuries.

Simplex Steam Vulcanizer Co., Omaha, Neb.—Simplex Steam Vulcanizers are made in sizes to accommodate the heavy work of garages or tire repairing plants or the lighter work for the garage of a private car owner. Any size hole up to 3 by 5 inches can be repaired on the small instrument for the use of a private owner.

Westinghouse Electric & Mfg Co., Pittsburgh, Pa.—Vulcanizers made by this concern are of the electric type. Only one style is made and this can be readily used in a private garage. The outfit consists of a heating coil rheostat and suitable plugs for making connections in the electric lighting circuit. Vulcanizing process with this machine requires from 15 to 30 minutes. Thermometer for watching the temperature is furnished.

Williams Foundry & Machine Co., Akron, Ohio—Akron-Williams equipment is said to be used in nearly every American tire manufacturing establishment. It is made in large sizes and is of the steam type. In addition to the regular vulcanizers inside patch and universal patch vulcanizers are made.

Zenith Factories Co., Minneapolis, Minn.—The Zenith vulcanizer can be carried around in the car and used on the road. It does away with the necessity of patching. It is operated by gasoline, which can be drawn from the tank and a good repair can be made in 15 minutes. When carrying a vulcanizer of this kind, the necessity of taking patches, cement and a large number of spare tubes on the trip is done away with.

Among other manufacturers of vulcanizers are the following who supply those of the portable type:

Artcome Vulcanizer Co., Toledo, Ohio.
Auto Steam Vulcanizer Co., Cincinnati, Ohio.
Automatic Steam Vulcanizer Co., Pittsburgh, Pa.
Dayton Inner Tire & Mfg Co., Dayton, O.
Electric City Specialty Co., Buffalo, N. Y.
Federal Auto Accessories Co., Columbus, Ohio.
Garage Equipment Mfg. Co., Milwaukee, Wis.
Gilson Motor Starting Co., Indianapolis, Ind.
Gray Specialty Co., Newark, N. J.
Hipwell Mfg. Co., Pittsburgh, Pa.
Kenmore Mfg. Co., Chicago, Ill.
McGraw Tire & Rubber Co., East Palestine, Ohio.
McVey Mfg. Co., Dayton, Ohio.
Motor Tire Repair & Supply Co., Pittsburgh, Pa.
New Process Vulcanizer Co., Toledo, Ohio.
Pittsburgh Auto Equipment Co., Pittsburgh, Pa.
Rice & Dayton Mfg. Co., Cedar Falls, Ia.
Simplicity Supply Co., Cleveland, Ohio.
Star Vulcanizer Co., Columbus, Ohio.
U. S. Auto Supply & Mfg. Co., Detroit, Mich.
Western Brass Mfg. Works, Chicago, Ill.

Among the manufacturers of vulcanizers for shop use not dealt with in the foregoing descriptions are:

Auto Tire Vulcanizing Co., Lowell, Mass.
Burge Machine Works, Chicago, Ill.
Comet Mfg. Co., Flandrau, S. D.
Haywood Tire & Equipment Co., Indianapolis, Ind.
Hill-Stage Co., Anderson, Ind.
Martin & Bro., Pomona, Cal.
Meili-Blumberg Co., New Holstein, Wis.
Milwaukee Auto Specialty Co., Milwaukee, Wis.
Vanderpool Bros., Springfield, Ohio.
Wheeling Stove & Range Co., Wheeling, W. Va.
Williams Foundry & Machine Co., Akron, Ohio.

Special Treads Prevent Cut Shoes

THE latest devices in the tire field for protecting tires have given excellent results to the motorist who has found it necessary to use them in his long trips over poor roads. He has made them serve him in rainy weather when there was a chance of skidding. Nearly all of the tire manufacturing concerns make these protectors to fit all needs. The following descriptions will give a fair idea of a few of the protectors being manufactured this year:

Pacific Leather Works, Oakland, Cal.—This company ufactures several types of protectors. The Type C is designed for all types of clincher, no-rim-cut, and plain side, or Fisk bolted-on tires. The body of this tread is hand-built of the company's own rubber and tire-fabric securely vulcanized together. The edges extend down far enough to come into the clinch along the casing. A tread-layer of Pacific leather is superimposed and another layer of tough, pliable leather is placed on the inside of the body. The three layers are then clinched together with "diamond-hard" studs, under a 2-ton pressure, three rows of the hard studs on the tread, and six rows of slow-wearing studs on the curve and sides to insure traction. Punctures are impossible, and the tread is water-tight. This device is guaranteed for 5,000 miles, without puncture.

Brictson Mfg. Co., Brookings, S. D.—The Brictson detachable tread is especially made to meet the needs of heavy cars on rough roads either in the city or country. This type completely incases the rubber tire and is applied to the rim in exactly the same manner as the regular tire or shoe. The tread has air holes for breathing, thus retaining the buoyancy of the rubber in the tire. This air space also obviates the possibility of the tread creeping and wearing out the tire. The tire is made as follows: First there is a layer of specially tanned, extra-pliable chrome leather. On the tread part, outside of this leather, is another strip of chrome leather, which entirely covers the tread surface that is exposed to the road. Next to these two thicknesses of leather are five layers, to prevent the tread from stretching. Next to these five layers is another layer of chrome leather. Through this outer layer of chrome leather and then through the five layers of tire fabric, the large beveled head steel studs and steel rivets are driven. These studs and rivets are clinched into another layer of leather which immediately follows next to the tire fabric, and then there is yet another layer of chrome leather, which covers the clinched ends of the studs and rivets and prevents them from coming in contact with the rubber tire. The ends of the leather, which extends between the tire and rim, are sliced thin where they are placed between the rubber tire and the rim, making it easy to tuck the leather into its proper place.

Standard Tire Protector Co., Akron, O.—Standard Tire protectors are removable treads which fit over any pneumatic tire and which are made from the same material as goes into pneumatic tire treads. They are made of several layers of Sea Island cotton fabric, and a compound of pure Para rubber. These protectors are made with either a plain or non-skid tread.

The Colorado Tire & Leather Co., Denver, Col.—The protector produced by this company is of the straight-side and clincher type, made to fit all sizes and styles of pneumatic tires. It is built of water-proof, non-hardening, non-cracking, specially-tanned leather. The successive layers of non-cracking leather are held securely together by a series of rivets, having large steel heads for contact with the road, which are riveted upon the inside and separated from the tire by the body portion of the protector; the number of rows of rivets are regulated by the size of the tire, ranging from three to six rows, depending upon the diameter and width.

Triple Tread Mfg. Co., Chicago, Ill.—This company manufactures a protector which is used for tires which have suffered blow-outs or rim cuts. This protector when vulcanized to these blown-out tires renders them absolutely puncture proof and non-skidding. The old casing is used as a foundation upon which to build, covering it entirely with tough, wear-resisting, water-proof French chrome leather. A guarantee of 3,500 miles is given

Leather Tire Goods Co., Niagara Falls, N. Y.—This company makes the Woodworth tread, which is a steel-studded leather covering, for use over automobile tires to protect them from punctures, cuts, wear, or other outside injuries. These protectors are made of two plies of chrome cow-hide leather, having between them on the middle part of the tread a reinforcement of tire fabric, which, being practically inelastic, prevents the treads stretching in circumference. The steel studs are clinched entirely through this material so that they are held very firmly in place and prevent any danger of the plies of material separating. The outer ply of leather in these treads is treated by a secret process which fills the pores with rubber-like gums that prevent moisture and dirt from getting into the fibres, and so keep the leather soft and tough.

Among the other companies manufacturing tire protectors of various kinds are:

Buffalo Rubber Mfg. Co., Sussex Ave. & Erie R. R., Buffalo, N. Y.
Davis Rober & Armor Co., Chicago, Ill.
Economy Tread Co., New York City.
Republic Rubber Tire & Shoe Co., New York City.
Maplebay Mfg. Co., Crookston, Minn.
Chas. E. Miller, Anderson, Ind.
Queen Leather Works, Oakland, Cal.
Sampson Tire Protector Mfg. Co., Grand Island, Neb.
Slama Tire Protector Co., Kansas City, Mo.
Twentieth Century Tire Protector Co., Midlothian, Tex.
Universal Tire Protector Co., Angola, Ind.

A Directory of Automobile and Motor Truck Tire Manufacturers

Pneumatic Tires

Acme Rubber Mfg. Co., Trenton, N. J.
Ajax-Greib Rubber Co., Trenton, N. J.
Batavia Rubber Co., Batavia, N. Y.
Braender Rubber & Tire Co., New York City.
Cataract Rubber Co., Buffalo, N. Y.
Century Rubber Co., New York City.
Combination Rubber Mfg. Co., Bloomfield, N. J.
Courtney Tire & Rubber Co., New York City.
Diamond Rubber Co., Akron, O.
Empire Tire Co., Trenton, N. J.
Englebert Tyre Co., New York City. (Importers)
Falls Rubber Co., Cuyahoga Falls, O.
Federal Rubber Mfg. Co., Milwaukee, Wis.
Firestone Tire & Rubber Co., Akron, O.
Fisk Rubber Co., Chicopee Falls, Mass.
Frontier Tire & Rubber Co., Buffalo, N. Y.
Gaulois Tire Corp., New York City. (Importers)
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Great American Rubber Co., Conshohocken, Pa.
Hardman Tire & Rubber Co., Belleville, N. J.
Home Tire Co., Trenton, N. J.
Hood Rubber Co., Watertown, Mass.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind.
Kelley-Springfield Tire Co., New York City.
Knight Tire & Rubber Co., Canton, O.
Lee Tire & Rubber Co., Conshohocken, Pa.
McGraw Tire & Rubber Co., East Palestine, O.
Manhattan Rubber Mfg. Co., Passaic, N. J.
Mansfield Tire & Rubber Co., Mansfield, O.
Marathon Tire & Rubber Co., Cuyahoga Falls, O.
Mattson Rubber Co., Lodi, N. J.
Michelin Tire Co., Milltown, N. J.
Miller Rubber Co., Akron, O.
Mohawk Rubber Co., Akron, O.
National Co., Chicago, Ill.
New Jersey Car Spring & Rubber Co., Jersey City, N. J.
Patterson Tire & Rubber Co., Lowell, Mass.
Pennsylvania Rubber Co., Jeannette, Pa.
Pharis Tire & Rubber Co., Columbus, O.
Portage Rubber Co., Akron, O.
Prince Tire Co., New York City.
Quaker Rubber Co., Philadelphia, Pa.
Racine Rubber Co., Racine, Wis.
Republic Rubber Co., Youngstown, O.
Russian Tyre Sales Co., New York City. (Importers)
Rutherford Rubber Co., Rutherford, N. J.
St. Louis Tire & Rubber Co., St. Louis, Mo.
Seamless Rubber Co., New York City.
Swinehart Tire & Rubber Co., Akron, O.
Thermoid Rubber Co., Trenton, N. J.
Tyer Rubber Co., Andover, Mass.
United States Tire Co., New York City.
Walpole Tire & Rubber Co., Walpole, Mass.
Zee Zee Tire & Rubber Co., Philadelphia, Pa.

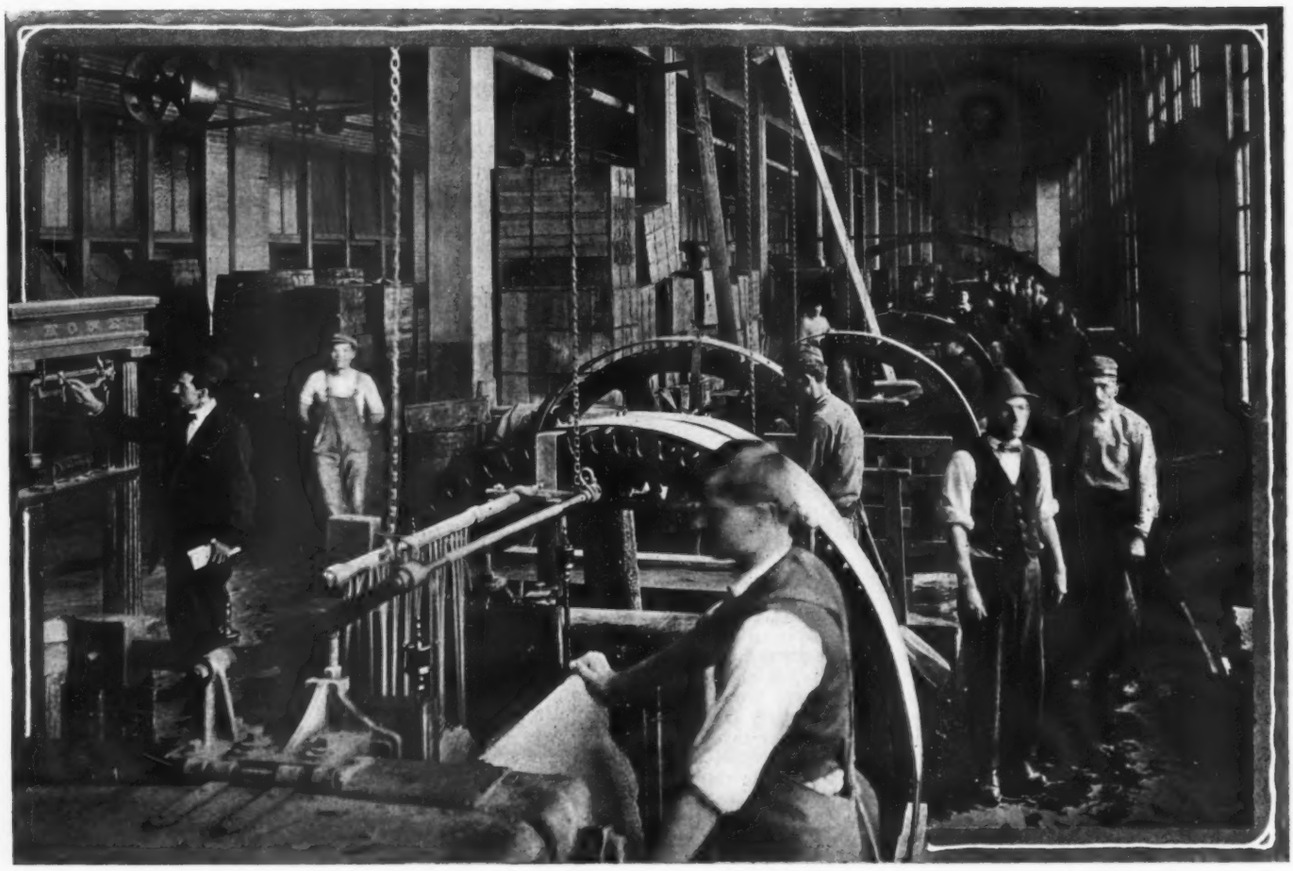
Solid Tires

American Marine Equipment Co., Boston, Mass.
Diamond Rubber Co., Akron, O.
Firestone Tire & Rubber Co., Akron, O.
Gaulois Tire Corp., New York City. (Importers)
Gibney Rubber Co., J. L., Philadelphia, Pa.
Goodrich Co., B. F., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelley-Springfield Tire Co., New York City.
Milford Rubber Works, Milford, Ill.
Motz Tire & Rubber Co., Akron, O.
Pennsylvania Rubber Co., Jeannette, Pa.
Polack Tyre & Rubber Co., New York City.
Portage Rubber Co., Akron, O.
Republic Rubber Co., Youngstown, O.
St. Louis Tire & Rubber Co., St. Louis, Mo.
Swinehart Tire & Rubber Co., Akron, O.
United States Tire Co., New York City.
Victor Rubber Co., Springfield, O.

Special Tires

American Automobile Specialty Co., Chicago, Ill.
American Rubber & Fabric Co., Philadelphia, Pa
American Spring Tire Co., Chicago, Ill.
American Wood Tire Co., Chicago, Ill.
Carboni Co., Albany, N. Y.
Carhart Laminated Tire Co., San Antonio, Tex.
Cleveland Puncture Proof Tire Co., Columbus, O.
Davies-Bach Mfg. Co., Cleveland, O.
Dayton Rubber Mfg. Co., Dayton, O.
Favary Tire Co., New York City.
Fudge Bros. Mfg. Co., Marion, Ind.
Indianapolis Tire Co., Indianapolis, Ind.
Lee Tire & Rubber Co., Conshohocken, Pa.
McNaull Auto Tire Co., Toledo, O.
Motz Tire & Rubber Co., Akron, O.
National Auto Spring Tire Co., New York City.
Overman Tire Co., New York City.
Perfect Tire Sales Co., Philadelphia, Pa.
Pioneer Steel Block Tire Co., St. Louis, Mo.
R. & S. Tire Co., Detroit, Mich.
Reason Tire Co., Pontiac, Mich.
Roberts Rubber Mfg. Co., Trenton, N. J.
St. Johns Rubber Tire Co., New York City.
Stahle Mechanical Tire Co., Boston, Mass.
Steel Cushion Tire Co., New York City.
Swinehart Tire & Rubber Co., Akron, O.
Torkington Tires Co., New York City.
Trautman's Air-Rubber Tube Co., Brooklyn, N. Y.

Factory Miscellany



Washing machine for rubber as used by the Goodyear Tire and Rubber Co.

THE above illustration shows the washing machine in use by the Goodyear Tire and Rubber Co. This machine is manufactured by the Birmingham Foundry of Derby, Conn. Its purpose is to clean the rubber of all foreign substances. The rubber is first fed into the cracker, a machine consisting of two cylinders with projections on their surface shaped like pyramids. This machine breaks down the rubber into a coarse, spongy mass. A continuous flow of water upon the rubber during this process washes out all dirt and other foreign matter.

After the rubber is broken down sufficiently in the cracker, it is then run through another washing machine, similar to the cracker except that the cylinders are grooved. The cylinders of this machine work very close together, so that the rubber is finely ground and run into a thin and comparatively smooth sheet. Water also flows upon the rubber during this process, which takes out anything foreign that might have slipped through the cracker. This continues until the rubber is thoroughly cleaned. After being run to a certain thickness the rubber is ready for the drying room.

GOODYEAR's Seattle Factory—The Goodyear Tire & Rubber Co., Akron, O., has started the construction of a large factory at Seattle, Wash. The factory will have a floor space of 10,000 square feet.

Gramm to Enlarge—The Gramm Motor Truck Co., Lima, O., will begin work in the near future to enlarge the plant.

Heinze Electric's Walkerville Site—The Heinze Electric Co., Lowell, Mass., which manufacture ignition apparatus, is about to enter Canada; it has acquired a factory site in Walkerville, Ont.

LaCrosse Rubber Mills Adds—The LaCrosse Rubber Mills Co., LaCrosse, Wis., is building a large addition which will double its capacity. The structure will be 55 by 200 feet and three stories high.

Awards $25,000 Factory Contract—The Hans Motor Equipment Co., LaCrosse, Wis., recently awarded contracts for its new $25,000 factory building and hopes to be able to begin operations on August 15.

Webster Electric's Racine Plant—The Webster Electric Co,. of Tiffin, O., is moving its plant and headquarters to Racine, Wis., and will occupy a large space in the former Racine-Sattley carriage works, which have been parcelled out to various concerns since being abandoned by the carriage company.

Established Portable Garage Department—The Milwaukee Corrugating Co., Milwaukee, Wis., manufacturing all kinds of corrugated metal goods, roofing, etc., has established a department for the manufacture and marketing of portable garages.

Establishes Kenosha Plant—The K. & F. Mfg. Co., organized recently by Chicago, Ill., and Kenosha, Wis., capital, has established a plant on Exchange street, Kenosha, for the manufacture of metal and glass containers, measuring devices, caps, etc.

John Brown's $100,000 Plant—The contract for a new plant for the J. W. Brown Mfg. Co., Columbus, O., maker of automobile lamps, has been awarded. The plant will be erected on a site recently acquired and will be 100 by 400 feet, two stories high, to cost about $100,000.

To Extend Plant—Two additional stories are to be added to the one-story Denver, Col., assembling factory of the Ford Motor Co., Detroit, Mich. The two stories are to have a frontage of 42 feet and a depth of 77 feet. The addition is to be of reinforced concrete and will cost $60,500.

Buick Contemplating Building—The Buick Motor Co., Flint, Mich., is figuring on building an assembling factory in the West. Fort Scott, Kan., is trying to coax it to that town.

Morgan & Marshall Again Building—The Morgan & Marshall Rubber & Tire Company, East Liverpool, Ohio, has again given out plans for the construction of three factory buildings.

Opens Factory Garage—The Milwaukee Auto Specialty Co., Milwaukee, Wis., manufacturing storage batteries, tire irons, spark plugs and other appliances, parts and devices, has opened a large garage in connection with its plant.

Force Increased by 105—From a force of ten men to a force of 115 men in 1 year, and from a capacity of from 1 to 250 tires a day from May 1, 1912, to May 1, 1913, is the record of the Mansfield Tire & Rubber Co., Mansfield, O.

Goodyear Increase Output—The Goodyear Tire & Rubber Company, Akron, Ohio, has increased its daily output to 6,200 automobile tires and 900 motorcycle tires, a total of 7,100 tires. Sales in May showed a gain of 18 per cent. over a year ago.

New Detroit Factory—The Goodspeed-Detroit Mfg. Company, Ltd., 272 Harper avenue, has been organized for making automobiles and doing machinery work on automobiles on contract. It has a factory, 48 by 154 feet, equipped with new machine tools.

Champion Spark Plug's Building—Sketches for a two-story and basement factory building, to be constructed for the Champion Spark Plug Company, Toledo, Ohio, have been drawn by the architects. The building will measure 60 by 121 feet, and will be designed to add two more stores.

New Site Given to Tire Company—The East Palestine Business Men's Association, East Palestine, Ohio, has closed negotiations by which they give a new site and provide temporary buildings for an automobile company, the second to locate there. The fund for financing the industry was obtained by lot sale.

Velie Buys Truck Plant—In order to facilitate the work of manufacturing its line of commercial vehicles, the Velie Motor Vehicle Company, Moline, Ill., has decided to conduct that work under the direction of a separate company, called the Velie Enginering Company. A new plant has been erected at Moline, adjoining the present pleasure car plant.

Haynes Agents at Factory—Haynes agents and salesmen gathered at the factory in Kokomo, Ind., on June 19, 20 and 21, to talk over the past season and lay plans for the coming one. The Haynes company has purchased a tract of land, 225 by 212 feet, southeast of its present factory, and will erect a new plant building to meet the requirements of increased business. The building will be a modern fireproof structure of concrete and steel.

Ford's Proposed Houston Plant—That the Ford Motor Company, Detroit Mich., may locate an assembling plant in Houston, Tex., despite difficulties which were encountered when the proposal was first made is indicated by a document filed for record in the County Clerk's office recently in that city, in which a tract of land was sold to the Ford Company for $27,500. This land contains about 5¼ acres. It is understood that the Ford Company will erect a large assembling plant there and distribute its cars to all parts of the south over Houston's railroads.

Stearns to Enlarge Plant—The F. B. Stearns Co., Cleveland, O., has increased its capital to $400,000 in order to acquire control of nearly 400 feet of land adjoining the factory on the west and running back from Euclid avenue to the Belt Line. Owing to the increase in the Stearns company's business during the past few years, it seemed advisable to the stockholders to acquire this additional land to provide for extensions. An agreement has accordingly been reached whereby the company obtains control of this land by an exchange of the realty company's securities for stock of the Stearns company under certain conditions. The company has in contemplation considerable new construction, plans for which are not yet ready for announcement.

Plant Supplies Mountain Region—The first story of the new Ford Motor Company's automobile assemblying station at Denver, Colo., will soon be completed. The structure will be four stories high, with a floor space of 172 by 130 feet. The building will be ready for occupancy about August 1. The plant will not be used for manufacturing, for the present, but will be equipped for assembling the parts of the machines to be shipped there from the main factory. Denver is to be made the distributing center of Ford cars for the entire Rocky Mountain region, and as soon as the plant can be occupied, virtually all the cars in this region will be assembled in that city. A large force of workmen will be required to turn out the machines to meet the steadily increasing business of the company in the west.

Shows, Conventions, Etc.

October 13.....Philadelphia, Pa., National Fire Prevention Conference, Philadelphia Fire Prevention Commission.
December 9-12.....Philadelphia, Pa., Annual Convention of American Road Builders' Association.

Race Meets, Runs, Hill Climbs, Etc.

June 25-28.....Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1.....Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Asso. to the Pacific Coast.
July 1-16.....Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4.....Panama-Pacific Road Race, Western Auto Assn.
July 4.....Columbus, O., 200-Mile Track Race, Columbus, O., Automobile Club.
July 4.....Taylor, Tex., Track Meeting, Taylor Auto Club.
July 4.....Washington, D. C., Track Races, National Capital Motorcycle Club.
July 4-5.....Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn.
July 5-6.....Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.....Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 11.....Twin City, Minn., National Reliability Tour, A. A. A.
July 20.....Seattle, Wash., Track Races, E. A. Moross.
July 21-25.....Grand Rapids, Mich., Auto Club Tour.
July 27.....Grand Rapids, Mich., Tour, Grand Rapids Auto Club.
July 27-28.....Tacoma, Wash., Tacoma Road Races.
July 28-29-30.....Galveston, Tex., Beach Races, Galveston Automobile Club.
Aug. 5.....Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn.
Aug. 12.....Kansas City, Mo., Reliability Tour, Kansas State Auto Assn.
Aug. 18-22.....Milwaukee, Wis., Fourth Annual Wisconsin Reliability Tour, under the auspices of the Wisconsin State Automobile Assn.
Aug. 29-30.....Elgin, Ill., Elgin Road Races, Elgin Road Race Assn.
Aug. 30-Sept. 6....Chicago, Ill., Reliability Run, Chicago Motor Club.
Sept. 1.....Columbus, O., 200-Mile Track Race, Columbus Auto Club.
Sept. 9.....Corona, Cal., Track Race, Corona Auto Assn.
Oct. 4-11.....Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co.
Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

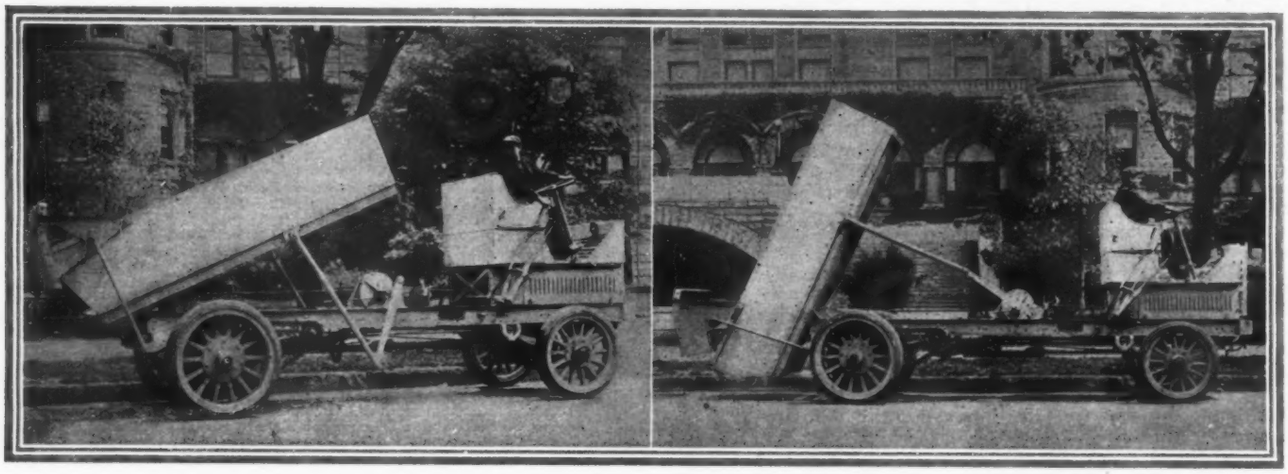
Foreign.

June 23-28.....London, England, International Road Congress.
July 12.....Amiens, France, Grand Prix Race.
July 13.....Paris, France, French Grand Prix Cyclecar Race.
July 15-30.....London, Eng., Olympia Heavy Motor Vehicle Show.
July 18-26.....London, Eng., Imperial Motor Transport Conference.
Aug. 28-30.....Ghent, Belgium, Institute of Metals, Annual Autumn Meeting, Ghent International Exhibition.
Sept. 21.....Boulogne, France, 3-Litre Race.
Sept. 25.....Isle of Man, International Stock Car Race.
October .....Paris, France, Automobile Show, Grand Palais, 10 days.
November .....London, Eng., Annual Automobile Exhibition, Olympia.

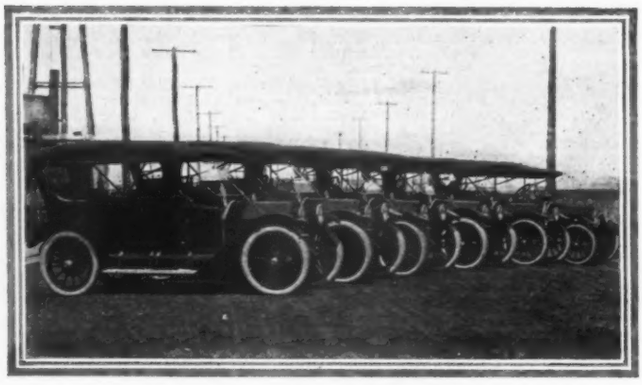
Aluminum plant of the Anderson Electric Car Co., Detroit, Mich.

The Week in the Industry

Engineer — Dealer — Repairman — Garage



New type of power-operated dump body used on the Alco trucks based on locomotive principle



Shipment of Marion cars to East Palestine, O.

Two Reos purchased by the Independent Torpedo Co., Findlay, O.

BELGIAN TRADE INCREASED—During the first 2 months of 1913 Belgian exports of automobile chassis, completed cars, and spare parts amounted to $883,880, against $693,816 last year. Imports totaled $175,458, against $179,603.

PERKINS RESIGNS PRODUCTION DUTIES—Robert Perkins has resigned from the Gemmer Mfg. Co., Detroit, Mich.

HAMILTON WANTS MOTOR TRUCKS—Hamilton, Ont., is in the market for three motor trucks for use in hauling gravel in public works.

ELECTRICAL WORKERS BUY CARS—The Inside Electrical Workers of Greater New York have purchased four Hupmobile touring cars for the use of the executive staff. The cars were bought from the H. J. Koehler Co.

BARKMAN GOES TO HUPP—A. B. Barkman has resigned from the Maxwell Motor Co., Inc., Detroit, Mich., to go to the Hupp Motor Car Co., also of that city. He becomes western sales manager and will make his headquarters in San Francisco, Cal.

BARTON PROMOTED BY OLDS—N. W. Barton has been appointed assistant to J. V. Hall, sales manager of the Olds Motor Wks., Lansing, Mich. He has been in charge of the department supervising all traveling mechanics of the company and all the details of the Olds service to users.

KING LEASES BROADWAY PREMISES—The King Motor Car Co., Detroit, Mich., has leased the entire ninth floor at 244 to 252 West 54th street, New York City, with a frontage of 125 feet in 54th street and 100 feet deep, about 9,000 square feet, which will be used for service and storage by the King Motor Car Co.

MOHAWK RUBBER PLACING AGENCIES—The Mohawk Rubber Co. has now gotten its factory in Akron, O., running, and has started to fill orders for its tires. An active campaign for dealers has been started, the company looking for one dealer in each town. The agency plan embodies giving each dealer an exclusive territory, and thus protects him as much as possible.

NOVA SCOTIA'S AMERICAN FIRE APPARATUS—The fire department of Halifax has imported from New York a La France combination hose carriage and pump, the city's first motor fire apparatus, horse-drawn engines having previously been used. It has a triple combination engine, pumping capacity 700 gallons per hour. An expert accompanied the machine and has given demonstrations and instructions to the men who will operate it.

DALLAS CLUB BUSY—An effort is being made by the Dallas Automobile Club to secure the $30,000 which has been allotted by the Federal government for road demonstration in north Texas. The club is ready to pledge the required $2 for each $1 spent by the government. The club has voted to improve and see that sign posts are erected on the portion of the Colorado-to-the-Gulf highway which passes through Dallas county.

FORT WAYNE'S LARGE GARAGE—The biggest garage in Fort Wayne, Ind., and the only one in the city to be absolutely fireproof will be erected this summer. The structure has already been leased by the Soest Bros. Electric Garage Co. The building is to cost $17,000 and will be one story in height and will be 88 by 150 feet in size. It will be of concrete and steel and will be thoroughly fireproof throughout. One of the features of the garage will be a ladies' rest room.

ALTERING CHICAGO'S CLUB HOME—Radical changes in the clubhouse of the Chicago Automobile Club, Chicago, Ill., are to be made during the summer. Plans have been made and approved for a substantial enlargement of the garage, the addition of a new ladies' parlor to the clubhouse proper, and the entire remodeling of the fifth floor. The garage will be increased one story in height, affording room for storing 60 per cent. more cars. Minor alterations include the enlarging of the turntables and rearrangement of the rooms and accommodations.

BATTERY STATION IN HARTFORD—The Hartford Electric Storage Battery & Supply Co., Hartford, Conn., has opened a battery station on Wells street.

AUTOMOBILES DECREASE HARNESS IMPORT—Decreases in the imports of fancy harness and saddlery into Argentina are attribtued to the growing use of automobiles.

TATE ELECTRIC CHARGING STATION—The Tate Electric Co. is opening a charging station and electrical garage in Montreal, Que. It is estimated that at least thirty cars will be housed.

GABRIEL SNUBBER AGENCY TAKEN—An agency for the Gabriel Snubber shock absorber has been taken in Indiana by the Cadillac Automobile Co. of Indiana, which is located in Indianapolis.

GRAND TRUNK'S AUTOMOBILE SERVICE—The Grand Trunk Railroad is considering the advisability of installing automobile service between Buffalo, N. Y., and Bridgeburg, Ont., for Sunday travel.

RITTENHOUSE DETROIT DIAMOND MANAGER—L. K. Rittenhouse has been made manager of the Detroit, Mich., branch of the Diamond Rubber Co., Akron, O. He was former Boston, Mass., manager of that company.

BUS LINE IN ST. LOUIS—A plan to use automobile buses to develop St. Louis County, Missouri, is under way, and a company to operate bus lines between the courthouse in St. Louis and Clayton, the county seat of St. Louis County, is preparing to ask the city for a franchise.

CHAPMAN RESIGNS—Frank E. Chapman has resigned as superintendent of the service and repair department of the Maxwell-Newcastle Manufacturing Co., Newcastle, Ind. He will be succeeded July 1 by E. A. Richmond, of Detroit, Mich., former director of the claims office of the Flanders Corp.

AUTOMOBILES FOR FIRE CHIEFS—An appropriation of $3,400 has been requested by the Board of Safety of Indianapolis, Ind. The money is to be used to buy automobiles for the second and third assistant fire chiefs, the chief and first and fourth assistants now being so equipped. Charles E. Coots, chief, says it is no longer possible for assistant chiefs to cover the city with horse-drawn vehicles.

WILLARD RESIGNS FROM FIAT—Richard D. Willard, secretary of the Fiat Motor Sales Co., Poughkeepsie, N. Y., and manager of the New York branch of that company, has resigned, having disposed of all his interests in the concern. Willard has not yet announced his new connection and it is expected he will take a brief vacation trip before taking up with any of several offers that have been made to him.

BUILD AUTOMOBILES AT SCHOOL—Two automobiles, small but in every respect serviceable machines and capable of making 25 miles an hour, are nearing completion in the machinery shop of the Polytechnic High School of San Francisco, Cal. Practically every part of the cars, from the engines and their accessories to the chassis and wheels, were built by young students of the school in the practical application of their work in the machinery course.

TRUCKS IN GETTYSBURG CELEBRATION—The Federal Government, in making preparations for the semi-centennial celebration of the Battle of Gettysburg, to be held at Gettysburg, July 1 to 4, has engaged fifteen Autocar motor trucks. In the transportation of camp supplies, commissary stores and the baggage of the veterans the Autocars will be extensively used, and in the intervals when not engaged in such duties will be employed for sightseeing purposes over the battlefield.

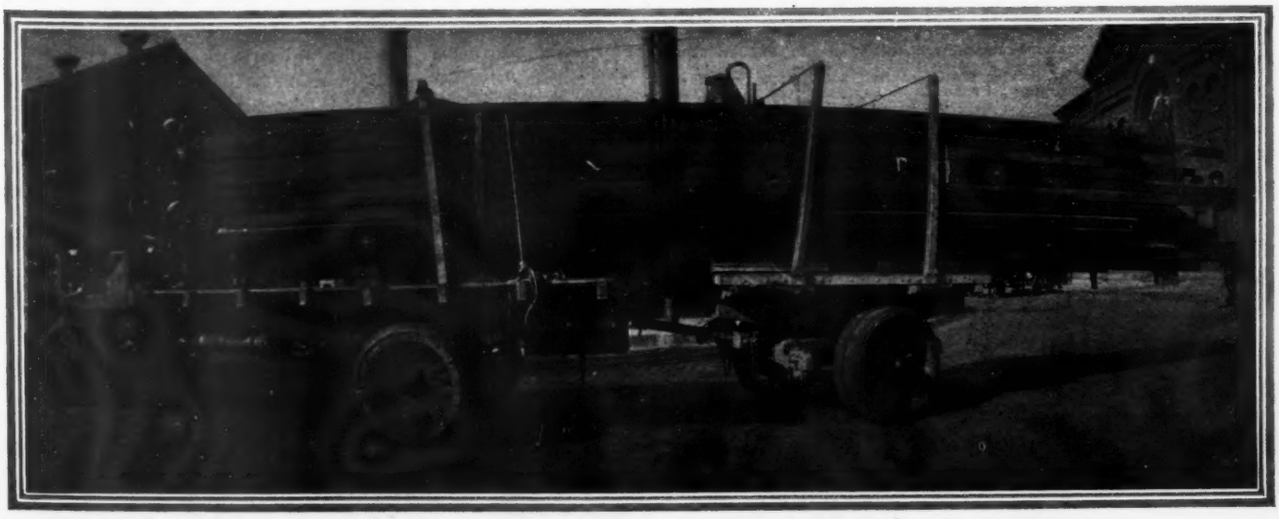
INVENTS HYDRAULIC LIFTING JACK—Capt. J. Lee Knight, of Fond du Lac, Wis., inventor of a new type of water pump or hydraulic lift, using the compound lever principle instead of suction, is forming a company to manufacture hydraulic devices of all kinds. Capt. Knight has designed a two-way hydraulic lifting jack especially adapted for motoring purposes and this will be turned out in large numbers. The jack has two lifting pistons and may be used either in horizontal or vertical positions.

LEASES FIVE-STORY BUILDING—To keep abreast with his fast-growing auto accessories business, Fred Campbell has leased the five-story building at 1109 Locust street, St. Louis, Mo., for five years and as soon as alterations are completed he will move his stock into the new quarters. Both wholesale and retail business will be taken care of at the new location, which is on the main downtown automobile route, but will be principally devoted to the wholesale trade, the retail trade being handled, where possible, at the West End branch at King's Highway and Delmar Boulevard.

FROEHLICH REPORTS GOOD BUSINESS—Jesse Froehlich, vice-president of the Times Square Automobile Co., New York City, reports that its business for the past six months has far exceeded the greatest expectation. Mr. Froehlich reports that this company expects to offer the greatest sensation yet that it has ever offered on high-grade runabouts in the near future, for $690. By special arrangement with the manufacturers, it has agreed not to advertise the name. Work will be started soon on two additional stories on its present building at 56th street and broadway.

Farm tractor built at Hartford, Conn. This machine is fitted with a two-cycle Motorette engine, the crankshaft extensions of which are equipped with pulleys for transmission of power

New Lozier construction. Several compartments concealed in apron are designed to carry all tools



A 15-ton load of lumber being drawn on a La France gasoline hydraulic truck in New York City

MOOERS KEETON ENGINEER—L. P. Mooers has become engineer of the Keeton Motor Car Co., Detroit, Mich.

HOGLE SALES MANAGER—W. M. Hogle has joined the Alma Motor Truck Co., Detroit, Mich., in the capacity of sales manager.

PERKINS RESIGNS—Robert Perkins, for several years production manager of the Gemmer Mfg. Co., Detroit, Mich., has resigned.

PEERY WITH ALMA TRUCK—G. H. Peery has joined the Alma Motor Truck Co., Detroit, Mich., in the capacity of business manager.

SWINEHART GOES TO PHILADELPHIA—B. C. Swinehart has been made manager of the Philadelphia, Pa., branch of the Republic Rubber Co.

ADDING TO SEGUIN GARAGE—The Seguin Auto & Cycle Co., Seguin, Tex., is building an addition to its present garage, and when completed will be 50 by 100 feet in size and fireproof.

CAR USED FOR RECRUITING—Capt. Thomas F. Ryan and his staff of the United States Army Recruiting Station are making a trip through Indiana in an automobile to obtain recruits for the army.

NEW CHICAGO-FRISCO ROAD—Two hundred automobilists from seven states met in Fremont, Neb., to organize for the purpose of building an automobile road between Chicago, Ill., and San Francisco, Cal.

EDENBURN RESIGNS FROM HENDERSON—W. D. Edenburn has resigned as manager of the newspaper department of the Henderson Motor Car Co., Indianapolis, Ind., to join the Apperson Bros. Automobile Co., Kokomo, Ind.

LEE TIRE IN DENVER—The Lee Tire & Rubber Co., Conshohocken, Pa., has established an agency in Denver, Colo., the same being distributors for Colorado, Wyoming, New Mexico, Salt Lake City and El Paso, Tex. J. A. Force is in charge.

GARRISON RESIGNS FROM HUDSON—W. W. Garrison, for two years associated with the advertising of the Hudson Motor Car Co., Detroit, Mich., has resigned from his office of publicity manager to connect himself with the Nichols-Finn Advertising Co., Chicago, Ill.

FIAT EQUIPS WITH TRUFFAULTS—Another addition has been made to the list of Truffault-Hartford equipped cars, this time the Fiat. The F.I.A.T. Co., Poughkeepsie, N. Y., will equip all its cars with the shock absorber made by the Hartford Suspension Co., Jersey City, N. J.

ZANESVILLE WANTS PATROL WAGON—Zanesville, O., is to have a new patrol wagon, provision for which was recently made by the Common Council. Safety Director Orr says that he would immediately advertise for bids and that the contract would not be let for at least two weeks.

NEW FRANKLIN OMAHA BUILDING—G. L. Smith, Franklin dealer in Omaha, Neb., expects soon to move into his new fireproof building at the corner of 23d and Farnam streets. The building will be three stories and basement, 66 by 132 feet, with a total floor space of 35,500 square feet.

HUGHES TULSA DESIGNER—Hughie Hughes has become designer and will design a new Tulsa car. He is being employed by Carden Green and J. B. Levy of Broken Arrow, Okla. Messrs. Green and Levy are wealthy oil operators, and are making arrangements to build an automobile factory in Tulsa, Okla. Hughes is making Indianapolis, Ind., his temporary headquarters.

ENJOINED FROM INSTALLING GASOLINE TANK—Although there are no state or local laws prohibiting, the Chippewa Valley Auto Co., Chippewa Falls, Wis., has been enjoined from installing a 10,000-gallon gasoline tank in connection with its garage in the city of Eau Claire, Wis. After the tank has been ordered, excavations for underground installation made, and everything prepared for the work, the state fire marshal stepped in and stopped the work. It is admitted, however, that tanks of 10,000 gallons capacity are dangerous, and both the State Legislature and several local Common Councils intend to pass restrictive ordinances.

Recent Incorporations in the Automobile Field

AUTOMOBILES AND PARTS

BAYPORT, N. Y.—William L. Mantha Co.; capital, $1,000; to deal in automobiles. Incorporators: William Westerbeke, William L. Mantha, Nellie F. Mantha.

BOSTON, MASS.—Brittons-Stevens Motors Corp.; capital, $50,000. Incorporators: William H. Britton, Geo D. Stevens.

BRITTON, OKLA.—Darling Automobile Mfg. Co.; capital, $25,000. Incorporators: C. P. Stealey, A. W. Hedge, H. O. Crum, Geo. W. Crawford.

BROOKLYN, N. Y.—Auto-Transit Co.; capital, $10,000; to deal in automobiles. Incorporators: J. J. Lilly, J. M. Battle.

CHICAGO, ILL.—Chicago Universal Motor Truck Co.; capital, $10,000. Incorporators: E. C. Rockwell, James H. Dunn, C. M. Stevens.

CHICAGO, ILL.—Foraker Motor Truck Co.; capital, $12,000. Incorporators: E. W. Brooks, G. W. Andrews, Paul A. Neuffer.

CINCINNATI, O.—Brown Automobile Co.; capital, $4,500. Incorporators: Michael Brown, W. B. Tully, S. M. King.

CINCINNATI, O.—Motor Sales & Service Co.; capital, $5,000; to deal in automobiles. Incorporators: J. B. Minor and others.

CLEVELAND, O.—Cleveland Auto & Supply Co.; capital, $5,000; to deal in motor cars, supplies and accessories. Incorporators: W. H. Toeple, A. B. Erdman, Albert Lutze.

CLEVELAND, O.—Commercial Auto Body & Mfg. Co.; capital, $50,000. Incorporator: M. E. McManus.

CLEVELAND, O.—Lake Shore Auto Carriage Co.; capital, $5,000; to deal in automobiles. Incorporators: C. M. Mundy and others.

DETROIT, MICH.—Coronation Motorette Co.; capital, $500,000; to manufacture automobiles and parts. Incorporator: H. A. Gardner.

DOVER, DEL.—Maxwell Motor Sales Corp.; capital, $10,000; to manufacture, buy, sell and deal in and with automobiles and all accessories thereto. Incorporators: R. H. Bagnell, A. Spottswood, Campbell, W. J. Maloney.

HAMILTON, ONT.—Hamilton Cadillac Motor Car Co.; capital, $40,000; to manufacture automobiles. Incorporators: James Nixon, Frank Newbury, J. A. Sauriol.

HAVERHILL, MASS.—Mansur Motor Truck Co.; capital, $30,000. Incorporators: Geo. B. Mansur, Kirke L. Moses, Nelson L. Furbush.

LANSING, MICH.—New Manufacturing Co.; capital, $150,000; to manufacture automobiles.

MEMPHIS, TENN.—Michigan Motor Car Co.; capital, $5,000. Incorporators: R. Kupferschmidt, C. V. York, Irby Bennett, J. J. Carrigan, H. L. Combs.

MONTREAL, QUE.—Lavoie Motor, Ltd.; capital, $1,000,000; to manufacture, buy and sell motors and engines, automobiles, trucks, aeroplanes, etc. Incorporators: A. J. Lavoie, H. S. Ross, O. F. Shearer and others.

NEW YORK CITY—Auto Efficiency Engineering Co.; capital, $50,000; to deal in automobiles. Incorporators: U. B. Soule, M. A. Dolbeck, Alfred Aram.

NEW YORK CITY—Bemis Car Truck Co.; capital, $150,000. Incorporator: C. A. Mattfeld.

NEW YORK CITY—F. & W. Motor Car Co., Inc.; capital, $5,000; to deal in automobiles. Incorporators: Jacob Wohlstedter, Gussie Fassler, Samuel Fassler.

NEW YORK CITY—Insular Service Corp.; capital, $50,000; to manufacture automobile trucks. Incorporators: Frederick H. Cox, Theodore Kirby, Arthur E. Carpenter.

PORT CHESTER, N. Y.—A. B. C. Automobile Co.; capital, $1,000. Incorporators: William D. Sporberg, William F. Gainey, Thomas F. J. Connolly.

SEDALIA, MO.—Schaffer Motor Co.; capital, $35,000; to deal in automobiles. Incorporators: F. K. Schaffer, J. H. Remington, C. S. Gray.

ST. LOUIS, MO.—Weber Motor Car Co.; capital, $2,000; to buy and sell motor vehicles. Incorporators: Edward Weber, Henry Weber, Albert Weber, Geo. Weber.

GARAGES AND ACCESSORIES

BROOKLYN, N. Y.—Brooklyn Auto Repair Co.; capital, $5,000. Incorporators: Louis N. Vause, Hans P. Freece, C. V. Mulligan.

NEW YORK CITY—Prest-O-Lite Co., Inc.; capital, $800,000; to manufacture generators for acetylene gas, etc. Incorporators: Clarence Winter, F. E. Sweet, S. M. Cooley.

MASSAPEQUA, N. Y.—Massapequa Auto Supply Co.; capital, $5,000; to deal in automobile accessories. Incorporators: J. S. Lilly, A. B. LaFar, G. R. Cooper.

NEW YORK CITY—A. & N. Gas Engine Starter Co.; capital, $1,000. Incorporators: Elwood C. Allison, Harvy B. Newins, Ira M. Higbee.

NEW YORK CITY—Century Garage Corp.; capital, $1,000. Incorporators: Arthur R. Martin, Addie M. Martin.

NEW YORK CITY—Consolidated Auto Supply Co.; capital, $10,000; to manufacture and deal in auto supplies. Incorporators: Paul Knopf, Carl Knopf, Morton Bishop.

NORFOLK, VA.—Grent Garage; capital, $10,000. Incorporators: W. Hunter Bell, A. B. Court, Julian Osborne.

PROVIDENCE, R. I.—Providence Taxi-Service Co.; capital, $1,000. Incorporators: John W. Perry, Charles E. West.

RICHMOND, N. Y.—Norwood Avenue Garage Co.; capital, $3,000; general garage business. Incorporators: J. P. Mark, Robert Romanelli, E. E. Goller.

SPRINGFIELD, O.—Gramont Tractor Car Co.; capital, $600,000; to manufacture a tractor plow which will be operated by a gasoline engine as a part of the plow.

ST. JOHN, N. B.—O. L. Motor & Mfg. Co.; capital, $150,000; to manufacture oil engines and other internal combustion engines and a kerosene adapter, so that kerosene may be used on gasoline engines.

TEXARKANA, TEX.—Purified Gasoline and Oil Co.; capital, $60,000; to build a refinery with a capacity of 50,000 gallons daily.

TOLEDO, O.—Arcade Taxi Co.; capital, $10,000; to carry on a general taxicab business. Incorporators: John J. Tierney, M. C. Helford, Geo. T. Duncan, R. C. Self, Andrew Gallagher.

TOLEDO, O.—Babcock Garage Co.; capital, $10,000; to handle automobile supplies of all kinds. Incorporators: Alonzo G. Duer, C. Wagenhausen, L. P. Wagenhausen.

CHANGES OF NAME AND CAPITAL

AKRON, O.—Akron Rubber Mold Machine Co.; capital increased from $30,000 to $60,000.

BIRMINGHAM, ALA.—Robertson Tire & Auto Co.; capital increased from $2,000 to $50,000.

DALLAS, TEX.—Marrs-Lingo Motor Co.; change of name to the Detroit Electric and Motor Car Co.

DETROIT, MICH.—Fisher Body Co.; capital increased from $50,000 to $1,000,000.

DETROIT, MICH.—Hupp Motor Car Co.; capital increased from $750,000 to $1,000,000.

HARTFORD, CONN.—Hartford Automobile Parts Co.; capital increased from $200,000 to $300,000.

INDIANAPOLIS, IND.—Premier Motor Mfg. Co.; capital increased to $1,250,000.

NORFOLK, VA.—Auto Specialty Co.; change of name to Auto Puncture Proof Co.

THOMASVILLE, VA.—Thomasville Motor Co.; capital reduced from $2,100 to $1,100.

YOUNGSTOWN, O.—Columbiana Rubber Co.; capital increased from $100,000 to $500,000.

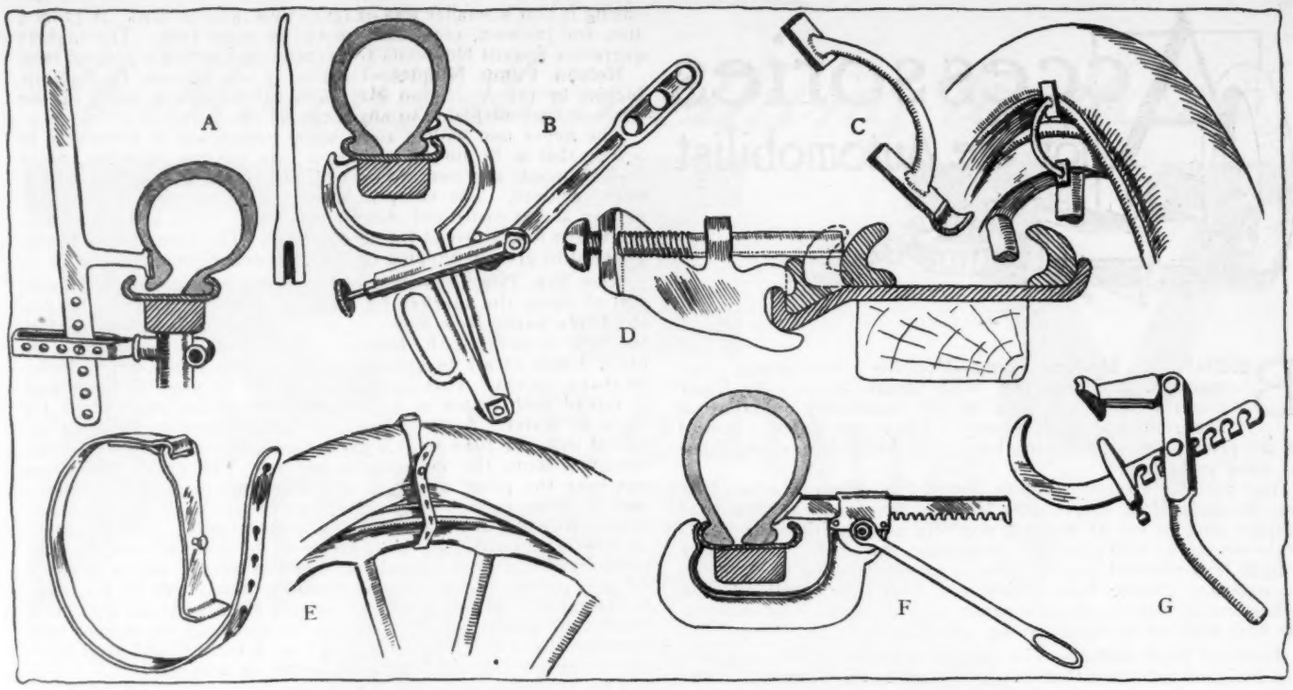
New Agencies Established During the Week

PASSENGER VEHICLES

Place	Car	Agent
Canton, O.	Peerless	Diebold Motor Car Co.
Charlotte, N. C.	Marion	United Motor Charlotte Co.
Charlotte, N. C.	Regal	United Motor Charlotte Co.
Clinton, Mo.	Maxwell	Industrial Iron Wks.
Elyria, O.	Peerless	T. M. Andress
Marquette, Mich.	Cadillac	Asire & Palmer
Milwaukee, Wis.	Franklin	Sanger Automobile Co.
Montreal, Que.	Clement-Bayard	Sharpe & Perriott
Montreal, Que.	Hudson	Legare Gadbois Automobile Co.
Montreal, Que.	Hupmobile	Auto Sales & Service Co.
Montreal, Que.	Mitchell	Auto Sales & Service Co.
Montreal, Que.	Oakland	Newmastic Tire Co.
Mound City, Mo.	Franklin	C. H. & J. Scott
Norfolk, Va.	Peerless	The Coburn Motor Car Co.
Ottawa, Ont.	Palmer-Singer	A. E. Rea Co.
Princeton, Ill.	Franklin	Evans-Coppins & Stark Co.
San Antonio, Tex.	Peerless	Woodward Carriage Co.
St. Joseph, Mo.	Franklin	J. M. Armstrong Auto Co.
St. Louis, Mo.	Enger	Knight Advertising Agency
Youngstown, O.	Franklin	Jacob Struhldreher

COMMERCIAL VEHICLES

Place	Car	Agent
Hartford, Conn.	Modern	Hotchkiss Motor Car Co.
St. Paul, Minn.	Stegeman	Western Machine Mfg. Co.



A, Rudolf. B, Eclipse. C, Becco. D, "Q. D." E, "2nd Man." F, L. & M. G. Morris

Tire Tools That Facilitate Repairs

TO make a tire repair today is not the difficult and tedious problem it was only a few years ago. And while this is due in a large measure to progress in design of the tire itself a great deal of the credit must be given to the wonderful development of the tools which facilitate these repairs and changes.

A few of these levers and other handy repair tools taken at random are shown in the above illustration. All are provided with means of adjustment whereby any size of tire can be dealt with.

Rudolf Tire Tool—This tool, shown at A, consists essentially of two simple hinged parts so arranged that great force can easily be applied to the side of the tire by simply hooking the smaller part over the nearest spoke as shown. It is equally useful for the removal or replacement of rims or clincher tires and can be applied at either side.

The outfit includes another simple lever formed with a socket-end so that it can be used as an extension handle where special force is required. The whole folds compactly into a length of 18 inches and weighs 5 pounds. The price complete is $2.50 and the makers, the Rudolf Tire Co., Pittsburgh, Pa.

Eclipse Tire Tool—The Shawyer Co., Springfield, O., have introduced a tool that will fit any size of tire from 3 inches to 5 inches and can be used for relieving lock rings as well as detaching one or both sides of a clincher tire. This is illustrated at B, in which it will be seen to consist of two caliper-like hinged jaws with an adjustable link surrounding the narrow part at the middle, to which a lever is hinged in such a way that the inner end bears powerfully on one of the jaws, bringing them both together. As shown, the tool is positioned below the rim, that is, between the spokes, but for removing lock rings or easing both sides of a clincher tire at the same time it is applied outside, the curved portion of the jaws surrounding the tire. This tool weighs 4 pounds and costs $3.

Becco Tire Grip—When putting on a clincher tire much trouble is always experienced in preventing one part creeping out over the rim while levering in at another point. To render the repairer independent of extra help in this connection the small tool shown at C will be found useful. The illustration shows the method of application. The nose is inserted into the rim, the curved handle meanwhile serving as a lever, after which it is simply turned down and bears on the felloe, effectually holding the bead at that point. It is equally applicable to wood or wire-spoked wheels. Manufactured by the Michigan Motor Specialties Co., Detroit, Mich., and listed at 25 cents each.

"2d Man" Tire Tool—Another handy little tool for the same purpose is shown at E. This consists of a steel hook to which is attached a leather strap for passing around the tire. After inserting the hook between the tire and rim the free end of the strap is pulled tight and buttoned to the tool. These are manufactured by B. Morgan, Newport, R. I., and sell at 50 cents.

Q. D. Rim Remover.—A remarkably simple tool to facilitate the removal of quick detachable rims is shown at D. This is stamped out of sheet steel and in use the body portion is hooked over the outer edge of the tire rim with the nose occupying a position between the ends of the locking ring. Then by turning the screw the rim is easily moved over and the locking ring exposed for removal.

It will be noticed that one of the conditions necessitated by this tool is that the ends of the locking ring be far enough apart to allow the entry of the hook, and the maker advises that if this space is insufficient the ends should be filed to suit.

The manufacturer is William L. Tobey, East Boston, Mass. Nickel-plated and casehardened this tool sells for 65 cents.

L. & M. Tire Loosener—The tool shown at F, manufactured by the Adam A. Long Machine Works, Rochester, N. Y., operates on the rack and pinion principle, producing a parallel motion of the jaws by turning the handle. By the nature of its construction this tool is applicable to a wide range of tire sizes providing the same leverage in all cases. As shown, the tool is in use as a shoe loosener on a clincher rim but it can also be used for removing the tire from a Q. D. rim. In this case the movable jaw is passed right over the fixed one, a semi-revolution of the removable handle being required. It is made of malleable iron and steel in two sizes, No. 1, for all tires up to 5 inches and No. 2 for 5.5 to 6 inches.

The handle is detachable so that the tool occupies a small space. The prices are $2 and $2.50.

Morris Tire Tool—The principal feature of this tire remover shown at G is the means for rapidly adjusting to any size of tire without removing any parts or turning screws. The lever is divided at the fulcrum and the fixed portion is notched to receive the hinge pin. This tool sells at $1.50 and is the product of the Wm. E. Pratt Mfg. Co., Chicago, Ill.

Accessories for the Automobilist

Brunner Motor Pump—Portable tire pumps for garages are meeting with great favor. By their use the long air lines of the stationary installation are rendered unnecessary. They are equally useful to the private owner, relieving him from the back-straining labor of hand pumping.

The portable electric pumping outfit, Fig. 1, manufactured by the Brunner Mfg. Co., Utica, N. Y., consists of a cylindrical storage tank on top of which is mounted a .25 horsepower Westinghouse motor with attached compressor, the whole supported by a light four-wheeled bogie. Power is supplied to the motor from an ordinary electric light socket and flexible connection. The equipment includes a pressure gauge, and 12 feet of high pressure air hose with an automatic valve connection.

Kimball Steel Armor—The steel tire bands shown in Fig. 4 are designed for use either as a protector for a blown-out cover or as a complete tire armor. The sections are each 2 inches wide at the treadplate, about 50 bands being required for a 32-inch tire. The side links are stamped from steel .125 inch thick and the hook portion of those next to the treadplate by projecting through the latter form an anti-skidding band that will be useful in wet weather.

In one form these steel bands are made to attach directly to non-clincher tires so that the outer cover can be removed and the inner tube changed as readily as if the armored coating were not used. The prices range from $13.25 to $35 for complete sets. The makers are the Kimball Tire Case Co., Council Bluffs, Iowa.

Reason Inner Casing—A new blow-out preventer that is claimed to double the life of tires is shown in Fig. 2. This inner shoe, marketed by the Perfect Tire Sales Co., Philadelphia, Penn., is of more massive proportions than is usual with this form of tire protector. It is composed of specially compounded rubber, reinforced with fabric on both outer and inner surfaces. The cushion portion A, being entirely surrounded by fabric, would naturally be lacking in resiliency were it not for a series of staggered air holes B in the thick part under the tread. These are formed in the rubber by pegging before the semi-curing process, and besides increasing the resiliency they reduce materially the weight.

In installing, the outer shoe of the tire is thoroughly cleaned inside and the new protective casing cemented in with pure gum non-vulcanizing cement, thus forming virtually a single outer casing that is thick enough to render puncture and blow-outs remote possibilities. An endless floating flap C protects the tube from rusty rims and pinching.

The only difference brought about by the use of this inner casing is that a smaller size of inner tube is to be used. A 37 by 5 tire, for instance, requires a 36 by 4.5 inner tube. The makers guarantee against blow-outs for 15,000 miles within 1 year of sale.

Nelson Pump Nipples—In Fig. 3 are shown two pump nipples by the A. Nelson Mfg. Co., Chicago, both being of the push-on type adaptable to any make of tire valve.

The upper one with a right angle connection is automatic in action, that is, by simply pushing it over the tire stem the valves in both nipple and tire are opened, permitting a free flow of air until removed. The valve in the nipple is of regular Schrader pattern and is easily and cheaply renewable. The body is a casting with a heavy thread for screwed cap. The stem also is deeply grooved to prevent slipping of the tube under pressure.

New Era Tire Treatment—A new tire treatment has been placed upon the market by Smalley Daniels, Detroit, under the trade name New Era. It is intended for injection within the tube to prevent the leakage of air caused by punctures or other kinds of air escapes, such as porous tubes, small leaks or leaky valves. This compound comes in powder form and is mixed with water in a proportion of about one can to 1.5 pints of water. After it has been mixed thoroughly it is injected into the tube with a grease gun, the valve having been removed from the valve stem before. The compound does not take the place of air in any way, but in case of a puncture it flows immediately to the place of the leak and stops it up before any great amount of air can escape. The air pressure forces a portion of the solution to the point of escape. The compound is said to contain no acids or alkalis and is marketed as a purely vegetable combination, which will do no harm to the rubber. It comes in cans of two sizes, one can No. 2 will treat four tires, 3 or 3.5 inches in sectional diameter; two cans of No. 3 for four tires 4, 4.5 or 5 inches, and four cans No. 2 for a set of tires 5.5 or 6 inches in section.

The representative of The Automobile was afforded an opportunity of testing this tire treatment. A 34 by 4.5-inch tire was inflated to its normal pressure and the required amount of the mixture injected into the inner tube with a grease gun after the valve had been removed from the stem. After the wheel on which the tire was mounted had been revolved several times to spread the treatment completely around the tube, a knife was stuck through the casing and tube, making a gash about ⅜ of an inch long. After an instant's escapage of air the leaking ceased immediately. On

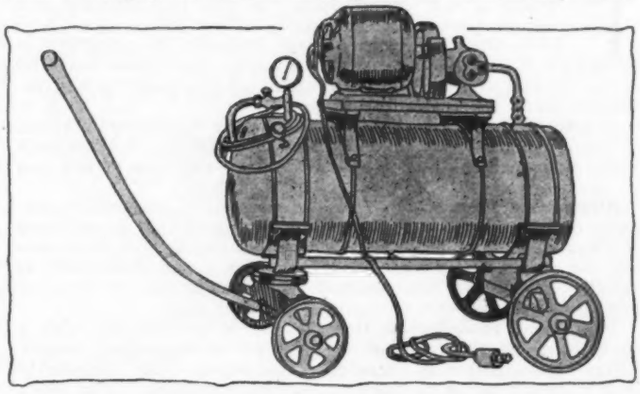


Fig. 1—Brunner portable electric tire-pumping outfit

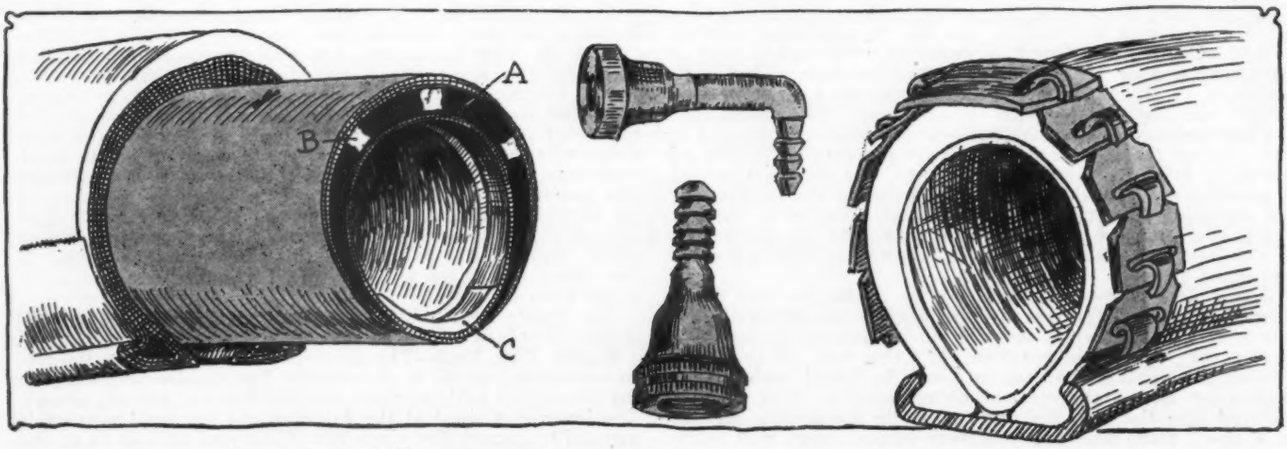


Fig. 2—Reason tire casing. Fig. 3—Bent and straight types of Nelson automatic pump nipples. Fig. 4—Kimball steel armor

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R·I·V

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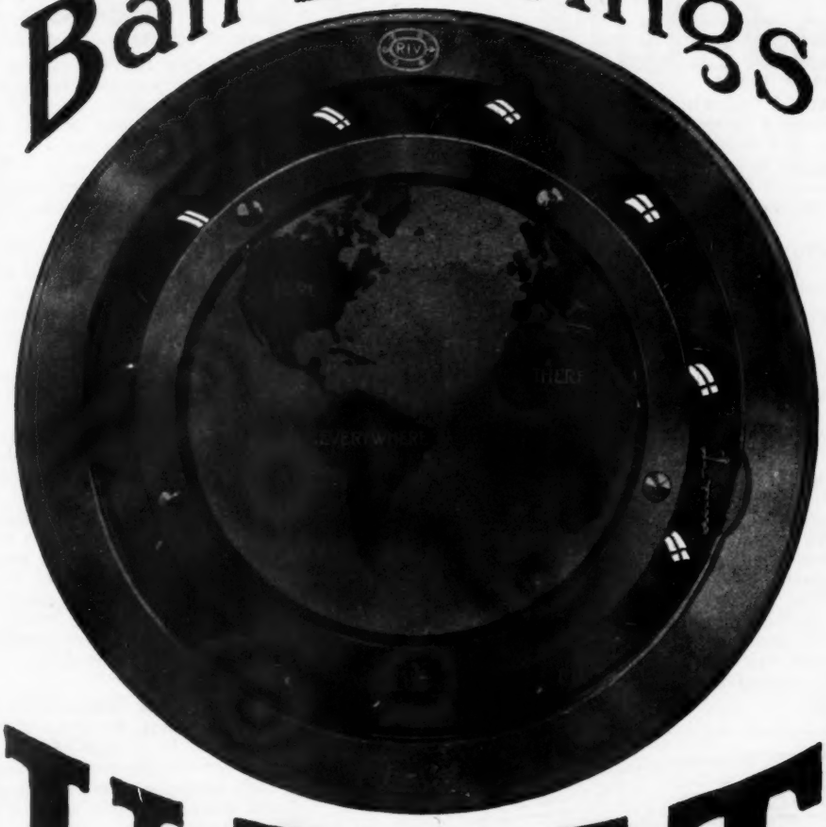

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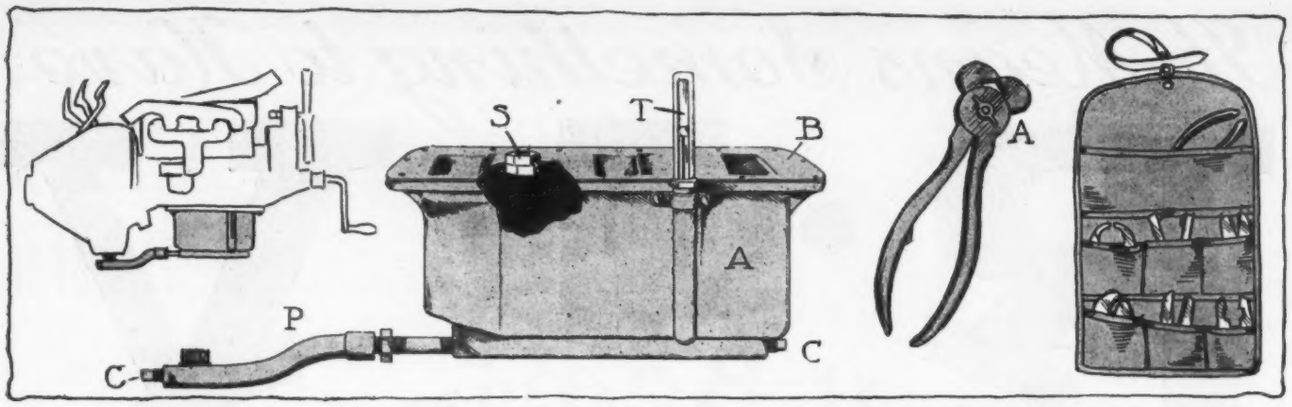

Fig. 5—Danver auxiliary oiler for attachment to crankcase. Fig. 6—Koeth's interchangeable tool

immersion in water there was positively no evidence of air leak anywhere around the point of incision. Several other similar tests had the same result.

Essankay Tire Filler—A substitute for air in tires is manufactured by the Essankay Products Co., Chicago, under the name Essankay. It is a soft material that lends itself to easy molding in the tire casing and is of such a composition that under slight compressive strains very little resistance is offered, though it strongly resists heavy stresses. It is claimed not to deteriorate with age.

20th Century Tire Protector—As a solution to the tire problem the 20th Century Tire Protector Co., Midlothian, Texas, offer the steel studded leather casing shown in Fig. 7. It is composed of one ply of heavy chrome tanned leather, covering the tire from clinch to clinch, on which a two-ply tread of Swiss leather is mounted. The steel studs are firmly clinched into the tread, which in turn is secured to the main body of the protector by a row of rivets on each side. The tread is renewable.

Emergency patches of similar construction are furnished by the same concern in various lengths, 8 inch being standard. This patch is listed at $2.

National Rubber Tirefiller is a substitute for air in pneumatic tires that differs from most other materials for this purpose in that it is composed entirely of rubber. In the preparation of this filler rubber of the best quality is cut into small particles and thoroughly vulcanized together in such a way that a high degree of resiliency is obtained. The makers state that in use it does not become hard or get flat and that no disintegration takes place. A feature of this filler is that after use in a tire that has worn out it can be removed and put into a new casing. A filler for a 33 by 4 inch tire costs $25, and the prices vary according to volume. The manufacturer is the National Rubber Tirefiller Co., which has its headquarters at Ft. Worth, Texas.

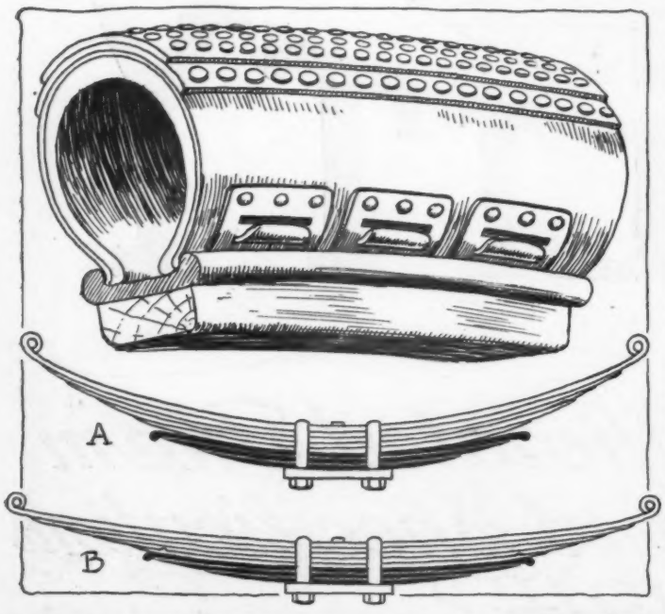

Fig. 7—20th Century tire protector. Fig. 8—Hoover auxiliary spring

Interlocks—A device for increasing tire mileage and reducing the danger of blow-outs is being marketed by the Double Fabric Co., Auburn, Ind., under the name Interlocks.

This tire-saver differs from general practice in inner protectors in that it is not a shoe but a complete inner tire, which occupies a position between the outer casing and the inner tube, strengthening the casing and protecting the tube from punctures. The manufacturer claims that their use does not affect the resiliency to any appreciable extent.

Danver Automatic Oiler—An auxiliary oiler for attachment to Model T Ford motors has been brought out by the A. C. Danver Co., Providence, R. I. The views in Fig. 5 show the device and the method of applying it to the base of the crankcase. It will be seen to consist of a flanged chamber A, drilled to fit against the existing bottom plate B of the crankcase, and a pipe P extending from it to the lowest point of the flywheel casing. In this way a complete circulatory system is obtained, the oil being raised from its lowest point by the flywheel.

In applying the device it is only necessary to remove the plug at the base of the flywheel casing and drill a hole through the crankcase cover between the second and third connecting rod dips for the insertion of the short standpipe S.

A telltale T is fitted to the side reading from 3 to 8 quarts. The normal filling is 7 quarts and this is poured into the breather pipe in the ordinary way of oiling. In passing from the flywheel the oil is conveyed through a copper pipe, not shown, to the timing gear before flowing into the crankcase. The oiler chamber C measures 12 inches long by 5 inches deep and is an aluminum casting. Clean-out plugs C are provided at the base and the end of the connecting pipe. The device can be put on a car in an hour and is listed at $12.

Koeth's Interchangeable Tool—This tool, shown in Fig. 6, consists of a set of pliers, pincers and shear tool jaws with a handle common to all. It is supplied with six heads for various purposes. In the set for automobilists the jaws include a combination plier with cutter, a close cutting nipper for cutting light material, a pincer head for heavy work, a leather punch, tinner's shears and Weed chain plier.

The illustration shows a handy roll of strong duck with separate pockets which forms a convenient way of carrying this miniature tool kit. It is also supplied in a compact wood case, the price for either being $3.

In attaching the various tool heads it is only necessary to remove a thumbnut on the center bolt. The head shown fitted to the handle at A is that for use in connection with Weed chains. It is designed to open the links easily and at just the correct distance. The maker is the Currier-Koeth Mfg. Co., Coudersport, Pa.

The Hoover Auxiliary Spring, shown in Fig 8, is remarkable among shock absorbers for its extreme simplicity. It will be seen that it consists of what is in reality a miniature spring designed on the same lines as the conventional main spring and placed directly underneath it. The illustration shows the principle of action of this device. When the car is carrying a light load or is running over smooth road and the main spring is consequently at its greatest curvature as at A, the tips of the auxiliary spring are free. The car is therefore riding on the main spring alone. But as soon as an unusual strain is encountered and the main spring is flexed the auxiliary comes into action as shown at B, supplying the desired additional support.

The maker is the Hoover Spring Co., San Francisco, Cal., and the device is supplied in five widths, 1.5, 1.75, 2, 2.25 and 2.5 inches respectively, at prices for each set of four from $14 for the small size to $18 for the largest.

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DOVER STAMPING and MFG CO

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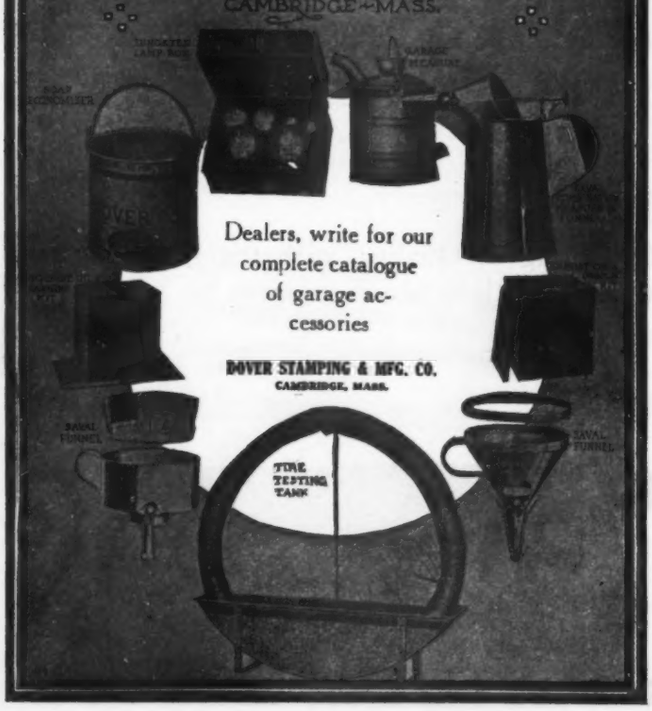
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Index to Advertisers

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

A

Adamson Mfg. Co..... 55
Ajax-Grieb Rubber Co..... 62
American Ball Bearing Co..... 57
American Motors Co..Back Cover
American Sheet & Tin Plate Co. 61
American Vanadium Co..... 47
Ames Motor Car Co..... 68
Approved Auto Specialties Co. 54
Ashton Valve Co..... 54
Atterbury Motor Car Co.....106
Atwater Kent Mfg. Works....101
Automatic Appliance Co.....102
Automobile Supply Mfg. Co... 60

B

Baldwin Chain & Mfg. Co..... 71
Barthel & Daly..... 61
Beaver Mfg. Co..... 59
Borland-Grannis Co. 66
Bosch Magneto Co..... 77
Bowser & Co., S. F..... 73
Braender Rubber & Tire Co..98-99
Brown & Co., Chas. D..... 72
Bretz Co., J. S..... 90
Brictson Mfg. Co..... 61
Broderick & Bascom Rope Co. 47
Buckeye Jack Mfg. Co..... 54
Buob & Scheu 54
Burlington Basket Co..... 73

C

Carr Co., F. S..... 54
Cartercar Co. 68
Chadwick & Trefethen..... 54
Chase Motor Truck Co..... 68
Cleveland Canton Spring Co... 60
Cole Motor Car Co..... 65
Connecticut Shock Absorber Co. 72
Continental Motor Mfg. Co....104
Corcoran Lamp Co..... 59
Covert Motor Vehicle Co..... 61
Cudahy Packing Co..... 72
Cullman Wheel Co..... 54

D

Daniels, Smalley 54
Dart Mfg. Co..... 64
Dean Electric Co..... 91
Diamond Rubber Co..... 80
Dixon Crucible Co., Jos..... 56
Double Fabric Tire Co..... 60
Dover Stamping & Mfg. Co.... 46
Durno Mfg. Co..... 58

E

Edmunds & Jones Mfg. Co..... 61
Eisemann Magneto Co..... 59
Essenkay Products Co..... 81

F

Federal Rubber Mfg. Co..... 55
Fedders Mfg. Co..... 3
F-I-A-T Automobile Co..... 64

G

Gibney & Bros., Jas. L..... 61
Gilbert Mfg. Co..... 57
Gilmer, G. Walker..... 60
Great Western Automobile Co. 66
Grossman Co., Emil..... 56
Gurney Ball Bearing Co.....100

H

Harris Oil Co., A. W..... 70
Hartford Suspension Co..... 2
Haynes Automobile Co..... 67
Henderson Motor Car Co..... 65
Herreshoff Motor Co..... 66
Herz & Co..... 75
Hodge & Graves..... 54
Hoffecker Co. 59
Holtzer-Cabot Electric Co..... 69
Horton Mfg. Co., F. L..... 57
Hotel La Salle..... 70
Hotel Woodstock 69
Houk Co., Geo. W..... 62
Hupp Motor Car Co..... 96
Hyatt Roller Bearing Co..... 92
Hydraulic Pressed Steel Co.... 68

I

Ideal Steel Wheel Co..... 57
Ingersoll-Rand Co. 74
Interstate Automobile Co..... 66
Invader Oil Co.....108-109

J

Jackson Automobile Co..... 67
Jacobson Machine & Mfg. Co.. 58
Johns-Manville Co., H. W..... 55
Jones Electric Starter Co..... 57
Jones Speedometer Co..... 57

K

K-W Ignition Co..... 73
Kales-Haskel Co. 58
Kamlee Co. 71
Keeton Motor Co..... 65
Kimball Tire Case Co..... 59
Kinsey Mfg. Co..... 61
Kissel Motor Car Co..... 64
Knox Automobile Co..... 67
Kokomo Electric Co..... 69

L

Lauth-Juergens Motor Car Co. 64
Lenox Motor Car Co..... 66
Life 59
Literary Digest 88
Lovell-McConnell Mfg. Co..... 95
Lozier Motor Co..... 67

Index to Advertisers

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

M

Marathon Motor Works..... 65
Marburg Brothers 62
Marion Motor Car Co..... 68
Mansfield Tire & Rubber Co... 75
Maxwell Motor Co..... 67
Mayo Mfg. Co..... 72
McCue Company 60
McFarlan Motor Car Co..... 64
Mercer Automobile Co..... 65
Metal Products Co..... 84
Metz Co. 66
Mezger Co., Inc., C. A..... 76
Milwaukee Motor Co..... 74
Moline Automobile Co..... 66
Mosler & Co., A. R..... 89
Motometer Co. 59
Motor Car Equipment Co..... 56
Mott Wheel Works..... 56
Motz Tire & Rubber Co..... 78
Mutty Co., L. J..... 54

N

National Motor Vehicle Co.... 63
National Tube Co..... 57
New Departure Mfg. Co.....103
N. Y. & N. J. Lub. Co..... 70
Nordyke & Marmon Co..... 64
Northwestern Chemical Co.... 71
Nyberg Automobile Works.... 66

O

Oakland Motor Car Co..... 64
Owen & Co., R. M..... 67

P

Packard Electric Co..... 55
Paige-Detroit Motor Car Co... 64
Parish & Bingham Co..... 54
Pathfinder Co., The..... 68
Peacock & Co., C. N.....107
Pennsylvania Rubber Co....86-87
Pilot Car Sales Co..... 65
Pittsfield Spark Coil Co..... 56
Premier Motor Mfg. Co..... 67
Prest-O-Lite Co..... 60
Prosser & Sons, Thomas..... 57
Pullman Motor Car Co..... 68

R

Rayfield Carburetor 62
R. C. H. Corp..... 65
Regal Motor Car Co..... 97
Remy Electric Co..... 78
Republic Rubber Co....2nd Cover
Rhineland Machine Works.... 56
R. I. V. Co..... 44
Robinson & Sons Co., Wm. C.. 58
Royal Equipment Co..... 54
Rushmore Dynamo Works..... 68
Rutenber Motors Co..... 62

S

Salisbury Wheel & Mfg. Co.... 58
Schoen-Jackson Co. 54
Searchlight Gas Co..... 59
Shaler Co., C. A.....105
Sheldon Axle Co..... 58
Sparks-Withington Co. 62
Speedwell Motor Car Co..... 94
Spicer Mfg. Co..... 55
Splitdorf Elec. Co..... 78
Spring Leaf Lub. Co..... 93
Standard Co. 55
Standard Gauge Steel Co..... 58
Standard Woven Fabric Co.... 45
Stanley, J. T..... 73
Stanley Works 77
Star Ball Retainer Co..... 61
Stearns Co., F. B.....112
Sterling Top & Equip. Co..... 46
Stewart-Warner Corp. 83
Stromberg Motor Devices Co.. 79
Stutz Motor Car Co..... 67
Swinehart Tire & Rubber Co.. 56

T

Texas Co. 1
Times Sq. Auto Co..... 62
Timken-Detroit Axle Co..... 85
Timken Roller Bearing Co..... 85
Troy Carriage Sunshade Co... 54

U

Underwood Typewriter 69
U. S. Fastener Co..... 58
U. S. Light & Heating Co..... 70
U. S. Tire Co..... 82
Universal Mfg. Co..... 55

V

Veeder Mfg. Co..... 69

W

Ward Leonard Electric Co., Front Cover
Warner Gear Co..... 76
Warner Mfg. Co..... 60
Weed Chain Tire Grip Co..... 60
Weston Elec. Inst. Co..... 71
White Co. 4
Willard Storage Battery Co....111
Willys-Overland Co. 110
Winton Motor Car Co...3rd Cover
Wisconsin Motor Mfg. Co..... 55

Z

Zenith Carburetor Co..... 62

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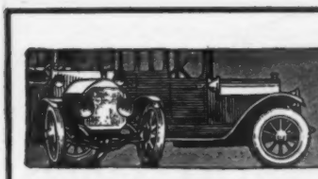
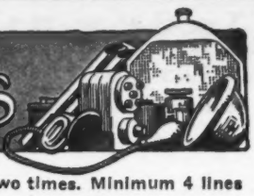


Classified Wants



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AMERICAN LAMP WORKS.
Mfgrs. Auto Radiators and Lamps, Gasoline Tanks, Hoods, Mud Guards, Mufflers, Windshields, Floor Pans. 253 W. 47th St., N. Y.

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24 H.P. Cleveland engine, good cond'n..$40
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Choice of 3 Planetary transmissions....$10
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500 new aluminum steering wheel spiders, machined and keyed.

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Theodore Hofeller & Co.,

Buffalo, N. Y.

FORD AGENTS—WE MAKE A SPEcialty of dust hoods to cover top when slashed down for Model T Ford 1910-1911-1912-1913 cars. Write for prices. Will save you money. The H. A. Hawes Storm Front Co., Coldwater, Mich.

FORD OWNERS—WE CAN MAKE YOUR car the easiest rider made with light or heavy load; no jolts, no jars, no upthrow. Write us. Thomas Auxiliary Spring Co., Canisteo, N. Y.

FORD OWNERS AND DEALERS
You will save trouble and money by installing our time elevating device.
Ford Parts Specialty Co.,
1211 Main St., Richmond, Ind.

FORD OWNERS—TOWNSAN VALVE ADjusters are the simplest, surest and lightest silencers in the world. $1.50, postpaid, Townsan Auto Spec. Co., Mitchell, S. D.

FORE DOORS
Made for all makes of cars. Prompt shipment guaranteed. F. E. Lortz Co., 9201 Hough Ave., Cleveland, O.

GET MORE WEAR

Out of your old auto tires. Send two old tires to be made into one sound one by the

Reclaim System.

2000 miles more wear can be obtained by spending from $2.50 to $4.50.

COWANS BROS.,

86 Columbus Ave.,
New York City

GUARANTEED BATTERIES.

6 volt 140 amperes.....$16.00
6 volt 80 amperes.....$13.00
6 volt 60 amperes.....$10.00

The Ampvo Battery Co.,
1607 Michigan Ave., Chicago, Ill.

HALF PRICE ON A LOT OF NEW AUtomobile parts. Motors, Timken Axles, Wheels, Q. D. D. Rims, Columns, and a variety of small stuff. J. S. Coates, Goshen, N. Y.

HAVE YOU TRIED THE NEW COTTERpin tool? No more skinning of hands; 15 tools in one, at $1.00. For sale by E. M. Worden, Ladysmith, Wis.

HUPP OWNERS

Write for our parts list.
Save you ⅓ on repair parts.

AUTOPARTS MFG. CO.,
Cor. Trombley & Orleans,
Detroit, Mich.

IF YOUR CAR IS NEW YOU SHOULD use Boyer's "3B" Waterproof Cleaner, Polisher and Preserver. Particulars free. Boyer Chemical Laboratory Co., 14 East Michigan Street, Chicago.

LION REPAIR PARTS
We have on hand a complete stock of repair parts for all models of Lion Cars.
Lion Motor Parts Co.,
124 No. 3rd St., Phila., Pa.

KEROSENE FOR AUTOMOBILES—OUR new Model B uses successfully half and half mixture lowest grades kerosene and gasoline. Satisfaction guaranteed or money refunded. Greatly increased power, very slow speed on high. Starts easy at zero. Special Agents' prices. Dept. 9.
THE AIR-FRICTION CARBURETOR CO.,
Dayton—Ohio.

LAUGH AT TIRE TROUBLE

Use Standard Tire Protectors.
Tire expense reduced two-thirds. Write to-day for our valuable accessory catalogue.
New York & Brooklyn Auto Supply Co.
1717-1719 Broadway, New York.

MORA REPAIR PARTS.

We have purchased the repair business of the Mora cars, including all stock on hand, drawings, patterns, jigs, office records and the right to receive the mail of the Company.

Owners of Mora cars will save considerable time by placing their orders for parts directly with us. We have in stock repair parts for all models. Philadelphia Machine Works, 67 Laurel St., Philadelphia, Pa.

NICKEL PLATE YOUR AUTO TRIMmings with Electro-Knickel. Prevents brass from tarnishing, iron from rusting. This is not a silver or mercury wash. We guarantee it plates (without a battery). Price, $1.00 prepaid. Write for information. Gun Metal Finish Co., 314 Powers Blk., Decatur, Ill.

RADIATOR SPECIAL—FORD T, $20.00. Best radiator value on market. Regular $25.00 Radiators built for any car made. Prompt Delivery. Correct Prices. Every dealer should get our proposition. Ask for price-list. Wright Radiator and Hood Mfg. Co., Clay Ave., Muskegon, Mich.

REAL BARGAINS IN MOTORS, UNIT power plants. Radiators for all standard makes of cars. Windshields, $7. Side oil lamps, brass or black, $2.75 pair. Gas or electric headlights, 8½ to 9 inches, $6 pair. $1 spark plugs, 20c. Universal joints, steering gears and other parts for cars at bargain prices. Write today to Nichoalds Company, 424 Grand River Ave., Detroit, Mich.

SCHEBLER CARBURETOR.
J. C. NICHOLS,
Direct Factory Distributors,
1673 B'way, at 52d St., New York City.
Tel. 6161 Col.
If your old carburetor is not giving satisfaction, exchange it for our new Model L. Send for our Exchange Proposition.

SPECIAL BARGAIN—NEW 1913 WESTinghouse ignition and lighting generator system complete. Price $75.00. Pellets Magneto Exchange, 1463 Michigan Avenue, Chicago, Illinois.

STEVENS AUTO TIRE VALVE
Adopted by Ralph DePalma, Winner of the Vanderbilt Cup at Milwaukee, 1912. Can be attached instantly without expense to any inner tube stem on any car. Saves one-half the time and labor necessary to inflate tires by any other method. Easily adjusted. Warranted not to leak. 200,000 in use. Send $1.00 for set of four. Try them 30 days and if not satisfactory money will be cheerfully refunded. Stevens Manufacturing & Supply Co., 504 Fisher Bldg., Chicago.

SCHEBLER MODEL "L" CARBURETORS, new, 1½-inch, $8.00 each. Order early. Kent Motor Car Co., Kenosha, Wis.

TOURING, ROADSTER, RACING BODIES. Seats, Special and Stock Sizes. Radiators, Hoods, Tanks and Fenders for any car. Get our prices ! ! ! Auto Sheet Metal Works, 1532-34 Michigan Avenue, Chicago, Ill.

UNION OXY CARBIDE CO.,
Manufacturers of Portable (weight 40 lbs.) and stationary, welding, cutting or lighting plants. Supplies of all kinds. Agents wanted. Fulton & Enfield Sts., Bklyn., N.Y.

Parts and Accessories

WANTED

WANT TO BUY FOR CASH SIXTY INCH treads. Hups. and Fords. Address B. U. Jones, Automobile Broker, Tampa, Fla.

WANTED—PREST-O-LITE TANKS. WE pay the following prices:
A. Presto tanks (large).....$9.00
B. Presto tanks (medium)..... 7.50
E. Presto tanks (small)..... 6.00
Ship in any quantity, C. O. D. or S. D. B. L.
Erwin Greer & Company,
1456-64 Wabash Ave.,
Chicago, Ill.

Rebuilding and Repairing

AJAX AUTO SHEET METAL PARTS Mfg. Co.

Linder & Meyers, Props.
Manufacturing and repairing of all Automobile and Aeroplane parts, in copper, brass, steel and aluminum.
RADIATORS AND ALUMINUM AUTO Bodies a Specialty
Sheet Metal, Brazing, Welding and Pipe Work of all kinds. Expert workmanship guaranteed.
Office and Factory:
38 and 40A West 62nd St., New York.
Telephone Columbus 704.

AUTOMOBILE CYLINDERS REGROUND, new pistons and rings fitted. Garage air compressors. Cast Iron Brazing Co., Manchester, N. H.

AUTOMOBILISTS

Carbon in Cylinders
removed while you wait.
Autogenous Welding, Broken Crankcases, Scored Cylinders made new. All broken automobile parts welded and made like new.
Our work guaranteed.
CAPITAL WELDING CO.,
45A Sabine St., Providence, R. I.

ACCURATE MACHINE WORK.
We are centrally located. Well equipped machine shop. Fine mechanical and electrical work. Automobile parts; cylinders bored and ground.
E. V. Baillard Co., 24 Frankfort St., N. Y.

ALL KINDS OF AUTOMOBILE PARTS welded; cylinders, crank cases, frames, brass and steel parts our specialties. New Jersey Welding Works, 23-25 W. 64th St., N. Y. Telephone, 3450 Columbus.

AUTO CASINGS RETREADED AS FOLlows: 30x3, $6; 30x3½, $7; 32x3½, $7.75; 34x4, $12; workmanship, material and price right; a trial will convince. Jungkind & Vogler, 158 Chambers St., N. Y. City. Repairing tires since 1896.

CYLINDERS REGROUND, NEW PISTONS

and rings fitted; gear cutting of all kinds and materials; transmission and bev. gears, piston pins and push rods of chrome nickel steel hardened, tempered and ground; guaranteed better than factory; old piston pins reground and fitted to your new pistons; old push rods reground and furnished with new guides; crank shafts, connecting rods, valves, crank cases, any part for your auto or motor, reproduced same as original, but better. Phosphor bronze bushings carried in stock. Send old or broken parts to go by. The Shop of Quality.

McCadden Machine Works,

St. Cloud, Minn.

CYLINDERS REGROUND
and fitted with new pistons and rings for $15 per cylinder. We make parts and cut gears of all kinds. Send us your old parts and we will repair or duplicate them in record time. Cracked cylinders, gear cases, etc., welded and made good as new. Aluminum, bronze and brass castings of every description. The Adapt Machinery Co., 1626 Wabash Ave., Chicago, Ill.

COPPER PIPE WORK.
Manufacturing and repairing of all Automobile and Aeroplane parts, in brass, steel and aluminum.
Radiators a Specialty.
Sheet Metal Work, Auto Blacksmithing, Brazing, Welding and pipe work of all kinds.
Rush Work a Specialty.
Reliance Auto Parts Mfg. Co., 244-50 W. 49th St., New York. Tel. 5135 Bryant.

BROKEN CRANKSHAFTS, CRANKCASES, cylinders, flywheels, gearteeth, pistons perfectly welded and machined, ready to replace. Scored cylinders made new. Atlas Welding Works, Rahway, N. J.

CYLINDER REGRINDING AND OXY-Acetylene Welding are lines in which we excel. Wrist pin scores repaired, $12—bore not enlarged—no new pistons required. We are an old experienced and responsible firm—ask Dun or Bradstreet. Quotations and full information cheerfully given.

Waterbury Welding Co.,
Waterbury, Conn.

HAVE YOUR CYLINDERS REBORED and ground, fitted with new pistons and rings by up-to-date factory methods. Price for four-cylinder motor, not over 4½" bore, $45.00; other sizes reasonable. Starbuck Automobile Co., 5225 Market St., Philadelphia, Pa.

Display your goods
in the show window of the automobile industry—the classified columns of
THE AUTOMOBILE

IF YOUR MOTOR, CARBURETOR OR magneto need tuning up or adjusting, drop me a postal and have this work done by an expert who has been in charge of similar work for years. W. Schumann, Mt. Hope, N. Y.

WELDING—WELDING—WELDING
Send us your broken crank cases, cracked cylinders, frames, or other parts that need welding. Brazing a specialty. Work guaranteed. E. W. Soleau, 264 De Witt Ave., Belleville, N. J.

"THE WELDING CO.,"

SPRINGFIELD, BOSTON, HARTFORD, Holyoke, Bridgeport.
Aluminum Cases and Cast Iron Cylinders a specialty. Five Shops with Five Years' successful experience. Ask for our printed Guarantee.

WELDING.
Cast Iron, Aluminum and all metals.
National Welding Mfg. Co., Inc.
523 Jackson Blvd., Chicago, Ill.

Situations Wanted

CHIEF ENGINEER AND FACTORY manager with extensive designing and manufacturing experience, who has produced successful cars (both pleasure and commercial vehicles), will be open for a position. Address Box 480, care The Automobile.

POSITION AS SUPERINTENDENT OR foreman in a tire repair shop; technically trained man, 10 years' experience; thoroughly understands tire building, repairing and chemistry. Address Box 228, care The Automobile.

Help Wanted

60 HIGH GRADE MEN WANTED
For all lines of the Automobile Industry. The Toledo Engineering Agency, Toledo, O. H. L. Croy, M. E., Mgr.; Member S. A. E.

WANTED—Man experienced in welding with oxy-acetylene process, especially automobile parts. State salary expected in first letter. Address Ft. Worth Welding Co., Ft. Worth, Texas.

Agents Wanted

RESPONSIBLE SALES AGENTS WILL find the Hartford Electric Starting and Lighting System an easy selling proposition. Territory now being assigned. Particulars on request. Hartford Suspension Co., 156 Bay Street, Jersey City, N. J.

Agencies Wanted

OLD-ESTABLISHED LARGE CYCLE AND Motor firm, situated in Midlands, possessing well-organized Sales Department, are open to negotiate for sole British representation of a small two-seater motor car of good design and reliable make; particulars of production to be sent (in first place) to Box 319, care of Durand Bennett's Advertising Offices, Old Serjeants' Inn Chambers, Chancery Lane, London, England.

Business Opportunities

HERE IS AN OPPORTUNITY FOR A LIVE

man to become partner or owner of the best paying Automobile Garage in Massachusetts. For further particulars address Box 271, care of The Automobile.

START AN AUTOMOBILE BUSINESS; capital unnecessary. Place to store them required. Send 50c. for full particulars. Box 53, Dunmore, Pa.

Auto Books

AUTOMOBILE AND MOTORCYCLE Tours—350 trips over the best roads in every State. 56 large pages of maps and road directions. 25c. postpaid. Motor Tours, 51 Chambers St., New York.

"FORD MODEL T REFERENCE BOOK"
First edition sold out in 5 months. SECOND EDITION, revised and re-written, now ready for sale. A complete ENCYCLOPEDIA on the FORD Car. Missing located, knocks cured, overheating remedied and all the troubles of Model T prevented by referring to the index and digest. Makes old Ford cars new and keeps new Fords always up-to-date. Write for new 8-page circular or sent postpaid, $1.00. Ford Reference Book Co., 57 W. 125th St., New York.

GAS ENGINE TROUBLES AND INSTALlation. Cloth, $1.00; flexible leather, $1.50. Automobile Troubles and How to Remedy Them. Cloth, $1.00; leather, $1.50. Ten other practical and reliable mechanical books. Send for circular.
Chas. C. Thompson Co.
1128 S. Wabash Ave., Chicago.

Auto Tops

TOPS BUILT, RECOVERED AND REpaired. C. G. Meyer & Son, Tiffin, O.

TOPS

New and recovered, excellent materials and workmanship. W. H. Newton & Son, No. 125 Elm St., Cortland, N. Y.

Tires

AUTO TIRE BARGAINS.

Having recently purchased a quantity of

FACTORY SECONDS,

Composed largely of Shawmuts, Continentals, etc., we offer as follows:

30x3	$6.00	34x3½	$8.75
32x3	7.00	36x3½	10.00
34x3	8.50	34x4	10.00
30x3½	8.00	36x4½	12.00
32x3½	8.50	38x4½	15.00

Write us if interested in other sizes. Tubes about half price. We are leaders of low price goods. Always have the largest stock. We have entire building at 49th St. and Broadway. 10% deposit required on all orders.

AKRON TIRE CO., INC.,
1612 Broadway, New York.

BARGAINS IN TIRES. WRITE FOR prices for your car.

ANGLO TIRE CO.,
237 W. 49th St., New York.

FORD OWNERS, ATTENTION.

Our Special Tires adapted to use on Ford Cars are Guaranteed for 3,500 Miles, and are giving the service.

		Special Empire Red Tubes
30 x 3	$10.75	$2.90
30 x 3½	14.75	3.90

5% discount on all orders accompanied by check or money order.

10% required on all orders sent C. O. D. Your money back if tires are not satisfactory on receipt of same. Empire Red Tubes are Guaranteed for Two Years.

Henschel Tire & Rubber Co., Dept. A.
1697 Broadway New York City

NON-SKID TIRES.

All standard makes at the following prices:

Size.	Price.	Size.	Price.
30—3½	$14.50	34—4½	$27.00
32—3½	16.00	35—4½	28.00
32—4	20.00	36—4½	29.00
34—4	22.50	36—5	31.50
36—4	24.50	37—5	32.50

I do not carry any but standard make tires, or deal in inferior brands. I will ship any size tire listed above to any part of the U. S. upon receipt of 10% of order, balance C. O. D.

M. C. MORAN
334 Amsterdam Ave., New York City

REAL BARGAINS IN TIRES

The tires we sell are not second-hand. They are not recovered tires with an alleged guarantee. Every tire we sell is a second or blemished casing of the best makes only, such as Century, Diamond and Michelin.

	Round Tread	Tubes		Round Tread	Tubes
28x3	$8.00	$1.85	36x4	$21.00	$4.00
30x3	8.50	2.05	34x4½	25.25	4.75
32x3	9.10	2.15	35x4½	25.75	4.75
30x3½	12.60	2.75	36x4½	27.00	5.00
32x3½	13.50	2.85	37x4½	27.25	5.00
34x3½	14.50	3.10	34x5	30.80	5.40
32x4	18.50	3.50	35x5	31.80	5.60
33x4	19.15	3.65	36x5	32.50	5.70
34x4	20.00	3.75	37x5	33.60	6.00
35x4	20.50	3.85	37x5½	40.00	6.65

Will ship any size tire listed above to any part of the U. S. upon receipt of 10% of order, balance C.O.D. subject to examination. Fisk & Firestone Tires 10% Higher.

H. V. DODGE,
1610 Broadway, New York City.
1174 Bedford Avenue, Brooklyn, N. Y.

TIRES TIRES

I will sell you good wrapped tread clincher tires cheaper than any one in the United States. New 1913 stock. Write for prices.

D. Ogden,
Columbus, Ind.

TIRE BARGAINS.

28x3, $7.20; tubes, $2.40; 30x3, $7.85; tubes, $2.50; 30x3½, $11.00; tubes, $3.35; 32 x 3½, $12.00; tubes, $3.55; 34x4, $17.25; tubes, $4.60. Tubes guaranteed. Other sizes accordingly. Get price list. 10% with order, balance C. O. D. Examinations allowed.

PARA AUTO TIRE CO.,
1415 Michigan Ave.,
Chicago.

TIRES TIRES TIRES TIRES

3500 MILES GUARANTEED!!!
50% TO 75% OFF!!!

Every Standard Make, Every Size, Fresh Clean Stock. We Guarantee 3500 Miles. You will get that and more—Your Money's Worth. We adjust in proportion to price and mileage. These prices are the lowest ever for our grade of tires. Send us an order today—NOW!

28x3	$7.00	35x4	$14.75
30x3	7.75	36x4	15.00
30x3½	9.00	37x4	16.00
32x3½	10.50	34x4½	17.00
34x3½	10.75	35x4½	17.50
32x4	12.50	36x4½	18.00
33x4	13.50	37x4½	18.50
34x4	14.00	35x5	19.00

TUXEDO AUTO TIRE EXCHANGE,
896A Eighth Ave., New York.
Near 53d St. Tel. 2947 Columbus.

Motorcycles

PARTS AND ACCESSORY MAKERS— The Motorcycle field is well worth your attention. 105,000 new machines in 1913. Leading medium, "Motorcycle Illustrated," 51 Chambers St., New York. Paid Circulation over 11,600.

An advertiser writes:

"Your columns are certainly pulling. So many orders ahead that we must cut out advertising."

Garages for Sale

FOR SALE—L. CONLY GARAGE, OF Herkimer, N. Y.; best location in town; fine stand for transients. Electric sign, air compressor and tank; tools of all kinds; doing fine business. Best of reasons why I must sell. Population of 20,000 within 5 miles.

Auto Instruction

AA1 IS HOW OUR STUDENTS STAND with auto owners. Our school is the oldest, best equipped, most practical and successful in America. Write, 'phone or call for particulars. Auto School of America, Dept. A., 1600 Michigan Ave., Chicago. Tel. 1088 Cal.

A. L. DYKE'S AUTO INSTRUCTION—A new idea of instructing you to care for and repair automobiles—with working models (from London), charts, etc., indorsed by all leading authorities. Send for free 32-page illustrated and interesting booklet. A. L. DYKE, Box 22, Roe Bldg., St. Louis, Mo.

AUTOMOBILE INSTRUCTION, $15. PRAC- tical overhauling, repairing and driving taught thoroughly. License guaranteed. Easy payments. Investigate. New York's big Practical Chauffeur's Training School, established 1905. International School of Automobile Engineers, 147 E. 40th St., New York.

AUTOMOBILE INSTRUCTION, INDI- vidual road work and small group classes. Day and evening. Arrangements for out-of-town men. Send for booklet. West Side Y. M. C. A. Auto School, 310 W. 57th St., New York City. Tel. 7920 Columbus.

GREER COLLEGE OF MOTORING Opposite Coliseum, 1459 Wabash Ave., Chicago. A practical education. 100 automobiles, 2 entire floors; 8 instructors. Day and evening classes. Free booklet. Phone Calumet 327.

WANTED — MEN AT ONCE, EARN while you learn; oldest, first chartered in the United States; free employment bureau; no classes; open year round. Special short time offer.

Mack's Auto School, Salem, N. Y.

Mailing Lists

AUTOMOBILE MAILING LISTS

13,191	Automobile Dealers	$25.00
9,627	" Garages	20.00
5,681	" Repairs	12.50
3,541	" Supplies	10.00

Neatly typewritten, showing Financial Rating in dollars of each one, alphabetically by States and Towns, 1913 compilation.

Ask for certain States if you do not want all.

877,000 Automobile Owners by States. Price on Application.

Ask for our "Silent Salesman," showing 2,000 other lists, etc.

Send check with order.

TRADE CIRCULAR ADDRESSING CO.,
166 West Adams Street,
Chicago.
Established 1880. Phone Franklin 1183

Auto Storage and Shipping

P. BRADY & SON CO.
Trucking and Storage.
Automobiles and Bodies Stored.
Automobiles boxed for export.
552-558 West 58th St. New York.
Telephone 3440 Columbus.

Auto Lists

AUTO LISTS—OWNERS, ETC., OF ANY State. S. H. Carroll, Jr., Albany, N. Y.

NEW ENGLAND AUTO LIST AND TOUR- ist includes weekly lists of all N. E. Auto Owners, Garages, Dealers, etc., with maps, selected N. E. routes and motor news, $10.00 yearly. 138 Pearl St., Boston, Mass.

Patents

PATENT FOR SALE OF AUTOMATIC door opening and closing apparatus for automobiles. Sold cheap if bought immediately. C. A. Sivon, 218 N. St. Clair St., Painesville, O.

Proposals

PROPOSALS FOR MOTOR TRUCKS— Army Building, Whitehall St., New York City, May 7, 1913. Sealed proposals, in triplicate, will be received here until 10 A. M. July 7, 1913, and then opened, for supply of from one to ten motor trucks. Information upon application. M. Gray Zalinski, Depot Q. M.

Miscellaneous

OWNERS DESIRING TO RENT THEIR cars by month or season, with or without chauffeurs, apply, giving full particulars, to Motor Rental Bureau, 501 5th Ave., N. Y.

The Clearing House

1" one time, $4.50; 2" one time, $8.75; 3" one time, $13.00; 4" one time, $16.75. Write for rates of larger spaces and longer terms.

FOR RESULTS

ADVERTISE IN

THE CLEARING HOUSE

Four weeks of CLEARING HOUSE advertising brought this comment from an advertiser (name on request):

> "Your columns are certainly pulling. So many orders ahead for ——— that we must cut out advertising."

The reasons for the success of THE CLEARING HOUSE as an order-puller are simple:

We have in THE AUTOMOBILE a weekly publication that through fifteen years' service has become the recognized medium of exchange in the automobile industry.

It is one of the very few publications whose circulation is 100% efficient for advertisers—every reader a prospect.

Its advertising rate per 1000 readers is way below the average.

Its classified department is the standard of the automobile industry.

Now, when we offer classified advertisers the opportunity at a slight increase in cost to make their advertisements stand out from the page like a headlight, by the use of display type—is it any wonder that THE CLEARING HOUSE has been an immense success to advertisers from the start?

For full particulars use the coupon below. And use it ***now.*** You owe it to yourself to learn all about this latest money-maker for advertisers.

THE CLASS JOURNAL CO.

The Class Journal Co., 239 W. 39th St., N. Y.

Gentlemen:—

Tell me all about THE CLEARING HOUSE, its rules, rates, and possibilities.

Name .....

Address .....

Cannot Blow Off

The B. & G. Special Tire Pump Hose Connection slips on and off in a second.

Mechanically attached, without springs or clamps. Gives quick, reliable and everlasting service. Price 35c. each.

C. CARRS
1777 Broadway, New York.

REAL BARGAINS

Windshields (any finish)	$3.00
Windshields (for Ford cars)	1.50
34 x 3½ Q. D. Wheels, set	10.00
E-M-F 30 dashes	1.00
E-M-F 30 1910 frames	10.00
E-M-F 30 rear springs	2.50
Running board irons, per pair	.50
Flanders 20 4-passenger tops	8.00
Buick 10 Surrey Tops	9.00
Side Lamps, black and brass, per pair	1.25
Spring clips	.10
Puritan Gas Tanks, Model B	5.00
Splitdorf Magnetos, type X, with box coil	20.00
Herreshoff fenders, per set	10.00
Spark Plugs	.33

AUTOPARTS MFG. CO.

459 Trombly Avenue

DETROIT MICHIGAN

FORD OWNERS

Ford Automobile Owners and others with brass trimmed cars, why not silver plate the parts and give your cars the 1913 white metal finish by using "U-KAN-PLATE" Silver Plating and Polish as a cleanser? It brightens metal, keeps the car in classy shape. No Mercury, no acids. Send for 10¢ sample can. Of dealers. Qt. cans $2. Pint cans $1.25. ½ pt. cans 75¢.

A. R. Justice Co., 621 Chestnut St., Phila.

JUNIOR MASTER VIBRATORS

$8.00

FORD OWNERS

The only MASTER VIBRATOR which will not stick or deteriorate.

LIFE GUARANTEE

J. B. MFG. SALES CO., 1777 B'way, N. Y.

AUTOMOBILE BODIES

Quick delivery from ready stock. Coupe, limousine, taxicab, touring, roadster and delivery bodies. New and used bodies. Our list includes every type.

Write us for some bargain prices.

PAUL MURRAY
Automobile Body Broker
518 Ind. Trust Bldg. Indianapolis, Ind.

PULLMAN TIRES AND TUBES

Quality at a Minimum Cost
Every One Guaranteed

PULLMAN TIRE CO.

1268 Bedford Ave. **Brooklyn, N. Y.**

Dealers, write for agency proposition.

The Clearing House

1" one time, $4.50; 2" one time, $8.75; 3" one time, $13.00; 4" one time, $16.75. Write for rates of larger spaces and longer terms.

Guaranteed Radiators for all Cars

The following is our stock list of radiators for the cars mentioned, subject to immediate shipment. Compare our prices with other lists.

Ford Model "T"	$18.00
Buick 10-32-33-14	27.50
Buick F-16-17-19-26-27-28	35.00
Buick 38-39	42.50
Hudson 20	33.00
Chalmers F-40	30.00
Lion 40	25.00
Warren 40	28.50
E-M-F 30	30.00
Flanders 20	30.00
Brush A-B	17.00
Anhut	15.00
Northern C	32.00
Wayne 30	35.00
Special 40 H.P.	15.00

Terms: One-third cash with order, balance C.O.D., or five per cent discount for cash with order.

When ordering, state year.

AUTOPARTS MFG. CO.
459 TROMBLY AVE.,
DETROIT MICH.

PEERLESS AUTO TOP DRESSING.

Waterproofs leaking mohair, duck and canvas. Makes old tops look like new. 1 gal, $3.75, ½ gal. $1.98, ¼ gal. $1.04.

PEERLESS LEATHER TOP DRESSING.

A preserver for all rubber, leather and pantasote. Does not stiffen or harden the top. 1 gal. $3.50, ½ gal. $1.85, ¼ gal. $.98, ⅛ gal. $.51.

PEERLESS LINING DYE.

For dyeing linings of all tops and curtains a black uniform color. 1 gal. $3.00, ½ gal. $1.60, ¼ gal. $.85, ⅛ gal. $.45.

PEERLESS BACK AND CUSHION DRESSING.

Renews and softens leather seats and cushions. Will not crack, chip or peel, wash or rub off. 1 gal. $3.50, ½ gal. $1.85, ¼ gal, $.98, ⅛ gal. $.51.

PEERLESS EXTRA FINE BLACK JAPAN.

Air drying with a high gloss finish on lamps, radiators and fenders. Will not crack, chip or peel. 1 gal. $3.75, ½ gal. $1.98, ¼ gal. $1.04, ⅛ gal. $.54.

PEERLESS FENDER JAPAN.

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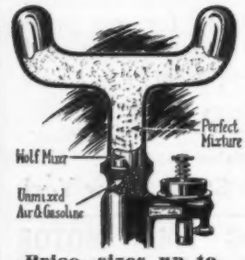

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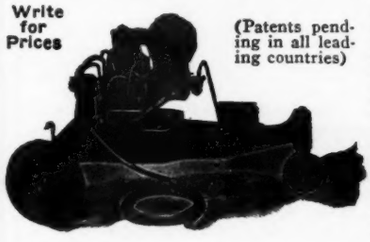

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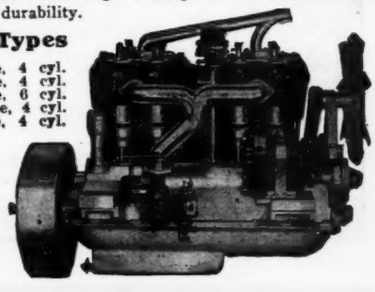

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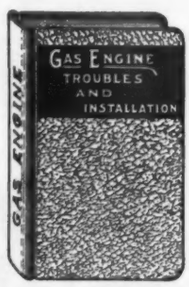

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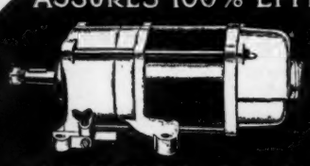

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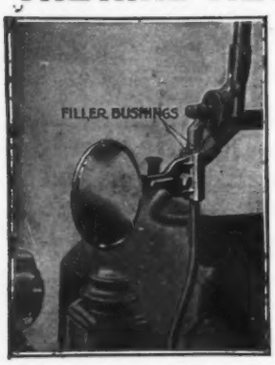

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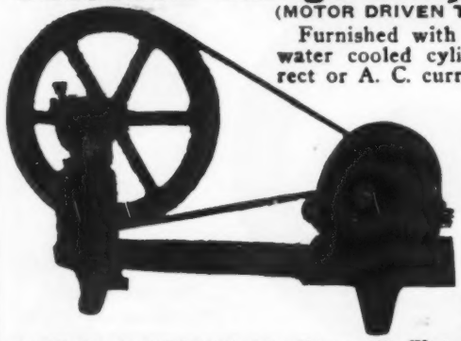

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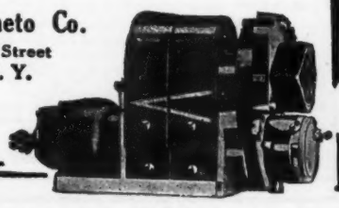

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Best Grade—Chrome-Vanadium
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Is Electricity Cheaper Than Gas Light?

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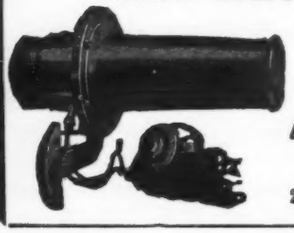
Are unreservedly guaranteed wherever sold. If your dealer does not carry the "Newtone" let us send one on approval.



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Add a Big Percentage of Tire Mileage

Strong, Resilient, Indestructible

These wheels are equipped with Standard Spokes, made by the Standard Company of Torrington, Conn.

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Safety First

Take no chances on Slippery Pavements and muddy roads.

Equip all Four tires with

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Universally used—Increasing demand—Easily handled—No dull season—No dead stocks.

Sold by all Reputable Dealers

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INTERLOCKS Double Your Mileage

INTERLOCKS make new tires wear twice as long, or give you an extra season's wear out of old tires.

More than that, Interlocks give you confidence that you will not have blow-outs, rim cuts or punctures to spoil your motoring pleasure.

Interlocks are complete inner tires—not inner shoes—placed between the outer casing and inner tube to strengthen the casing and protect the tube from punctures. They insure safety—make new tires give twice the usual mileage, and add 1000 to 5000 miles to old ones. Don't affect resiliency.

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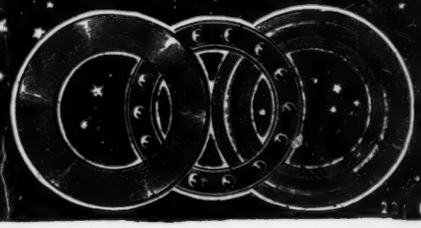

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3¾ x 5¼ 4 and 6 cylinder
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Standard or Unit
and
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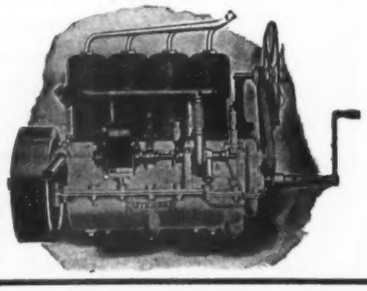
Standard Types.
All L Head 4 Cycle.

Manufacturers are invited to investigate our service and our facilities. Literature on request.



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More power – Less fuel – Wider range

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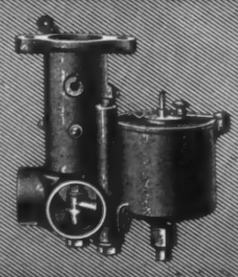

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Patented

The Sparks-Withington Co.

JACKSON, MICHIGAN — WALKERVILLE, CAN.

Holds World's Stock Championship

Fastest Stock Mile

National

Holds World's Record for Fastest 500 Miles in Competition

Our Answer

Uncharitable rumors, prompted by either malice or ignorance, have charged the National Motor Vehicle Company of Indianapolis with unfairness and unsportsmanlike conduct during the recent 500-mile race.

These defamatory insinuations, all the more vicious because not definite nor in the open, include:
That the *National* people conserved the speed of the winning car to keep it from breaking the *National's* record.
That the *National* people did work in their factories prior to the race, for the foreigners as against the Americans.
That the *National* employees bet heavily on Goux and therefore worked to have him win.

If anyone could have done the impossible, and held Goux back, it still does not explain why some of the other drivers did not get in front, win the race and break the *National's* record.

M. Goux had a safe lead. It is conceded that he did not have to struggle as hard to keep first place as others did to keep secondary positions.

Any attempt to besmirch the *National's* reputation only magnifies its marvelous performance and emphasizes how easy it was for Goux to win and how others failed to surpass the record of either Goux or the *National*.

It is true that the National Company helped the Peugeot team. *That* is sportsmanship. If we had refused, we should have been censored even more severely. It is equally true that the National Company also helped *seven other teams*, both foreign and American, without favoritism. We simply extended the courtesies naturally expected from a resident to a visitor.

At the beginning of practice for the race the National Company offered its services to any and all competitors. This, too, in the face of the fact that every bit of assistance rendered by the National Company to a contender made it all the more possible for these contenders to break the *National's* record.

The National Company tried to be fair, and was fair.

Frequently in the past the National Company has helped competitors in races where *National* cars were entered. The National Company believes in helping the cause of good, clean sport and building it up. In helping cars this year the National Company lived up to its lifelong policy.

Our racing competitors in years past who know our attitude and who know how scrupulously we adhere to the rules of fair play only laugh at these charges. They know how empty and unjustified they are.

To the man who is familiar with racing and with the management of such clean sportsmanship events as the 500-mile race the insinuations direct and indirect against the National Company are both ridiculous and shamefully indicative of ignorance.

The greatest of all reasons why these charges are untrue is the unimpeachable and honestly won reputation of the National Company.

The National Company considers it a rare tribute when foreigners seek its advice and assistance in a matter so important as this race. We also consider it an honor that Americans came to us. We will extend the same assistance again under the same circumstances.

William Faroux, the Peugeot consulting engineer, in a signed article in Motor Age, explains the whole situation. He gives credit where it is due, praises Americans for clean sportsmanship, admits the *National's* record is one worthy to attempt to lower and equally hard to achieve.

The only way the *National* is "to blame" for the record not being lowered is that it made the record. In so doing it gave the world a criterion for speed, power, reliability and stamina.

At no time during the race was the *National's* record reached by any car.

National, 78.72 miles per hour (1912 winner)

1913 winner, 75.92 miles per hour

1911 winner, 74.61 miles per hour

Five models, $2750 to $3400

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Electric Lighted **SIX** Self Starting

Series "S"—45 H.P., 2, 4 and 5 Pass.— $2300
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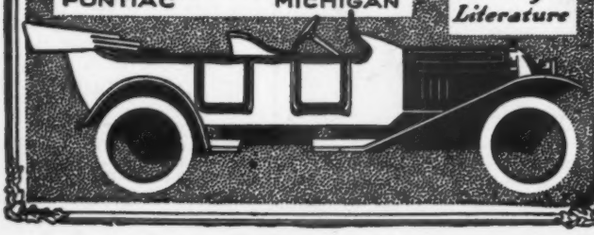

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$50 Stewart Speedometer with Grade Indicator
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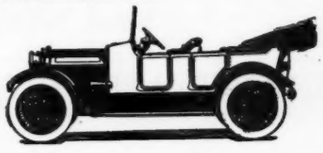

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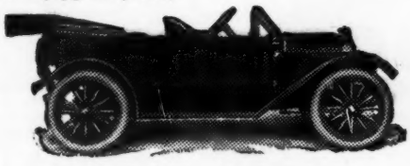

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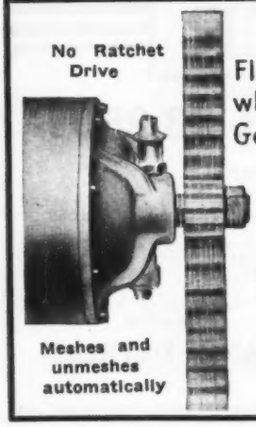

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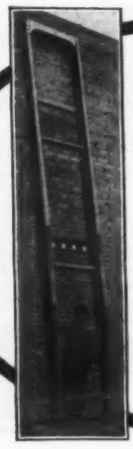


FRAMES

For Pleasure Cars, Commercial Cars Trucks

HYDRAULIC

HYDRAULIC PRESSED STEEL CO.
CLEVELAND

CHASE

The Emblem of Efficiency

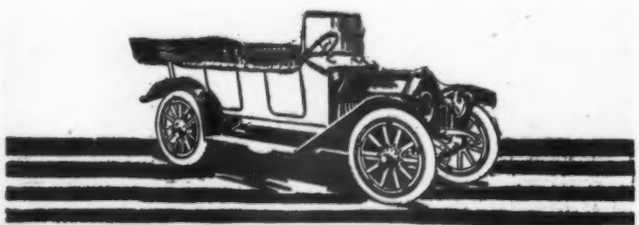
Chase Motor Trucks

Six Efficient Models **Every Style of Body**
Capacities 500 to 4000 Pounds

CHASE Trucks have the only talking point really needed for the dealer and the user of our famous line—low proven delivery costs—everything considered.

Our literature has commercial value. Write for your copy F-1 now.

Chase Motor Truck Company
303 So. West St. Syracuse, N. Y.



Model 5-A $1700
Touring Car Fully Equipped
Electric Cranking and Lighting

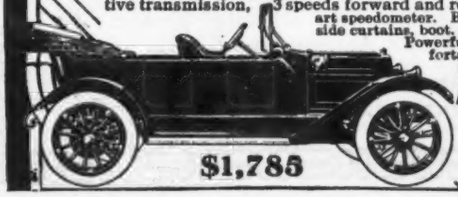
People who demand POWER, ENDURANCE, LUXURY and SAFETY in a motor car, drive the time-tested GEARLESS TRANSMISSION CARTERCAR. Presented in four excellent models $1600 to $2000.

Cartercar Company, Pontiac, Michigan
Branches: New York, Detroit, Chicago, Kansas City, Atlanta

The Kentucky Thoroughbred

Ames "45"

With Electric Self-Starter. An Electric Starter of proved efficiency is one of the features of the Ames "45"—a car with every essential refinement contributing to comfort, yet priced at $1,785. Without Starter, electric lighted, $1,635. Made with well-known "Amesbilt" body, 5-passenger, motor-driven electric lights. Perfect cooling system. Force-feed pump. Schebler Carburetor, new Remy dual system high tension magneto, oil-driven pumps. Sight-feed. Warner multiple disc, Raybestos-lined clutch. Selective transmission, 3 speeds forward and reverse. Stewart speedometer. Best mohair top, side curtains, boot. 36x4-inch Tires. Powerful, speedy—comfortable—unequalled at price. Write for catalog.



$1,785

AMES MOTOR CAR COMPANY
Owensboro, Ky.

Speed
Accuracy
Stability

These are essential features in a typewriter, possessed *only* by the

Underwood

which holds every International Record for

Speed and Accuracy

"The Machine You Will Eventually Buy"

Underwood Typewriter Co., Inc.
Underwood Building, - - NEW YORK
Branches in All Principal Cities

The Way to Decide

If you are in the market for a horn and your dealer shows you a dozen or more styles, just ask him to sound them for you and it's "dollars to doughnuts" you'll pick the

REACTO

The horn with the effective tone—does not screech or squawk

Send for Booklet 158 A
THE HOLTZER-CABOT ELEC. CO.
Brookline, Mass.
Chicago, Ill.

You Can Walk from There to Anywhere **The WOODSTOCK** The Hotel of Comfort
43rd St. Just East of Broadway, New York

Our new addition is ready for occupancy. We now have 360 rooms with 265 baths. Write us for descriptive folder with typical floor plan and rate card. Wire for reservation at our expense.

Rates from $2.50 to $4.00 per day

W. H. VALIQUETTE
MANAGER
Also THE BERWICK, Rutland, Vermont

Veeder

Mileage Must Be Exact

if you want to figure out the cost of upkeep of pleasure or commercial vehicles. TIRE MILEAGE in particular, is a most important consideration—to be *certain* and *exact* you must use a VEEDER HUB ODOMETER. For gasoline or "juice" mileage a VEEDER HUB ODOMETER *must be smashed to be wrong.*

Neat, durable and compact it can be easily attached. Price, complete **$25.00**

At your dealers', direct from our factory or at the following agencies:

T. H. Cranston & Co., 56 E. Randolph Street, Chicago, Ill.

Bernard I. Bill, 543 Golden Gate Avenue, San Francisco, Cal.

The Veeder Manufacturing Company
C. H. VEEDER, President D. J. POST, Treasurer
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HARTFORD, CONN.

Makers of Cyclometers, Odometers, Tachometers, Tachodometers, Counters and Small Die Castings.

Kingston IGNITION DEVICES

RELIABLE, DURABLE, ECONOMICAL

For ten years we have been making magnetos, coils, switches, spark plugs and other ignition devices that have always given satisfaction.

Our experience may be valuable to you. Let us help you solve your ignition problems.

KOKOMO ELECTRIC CO., KOKOMO, IND.

"K No. 00 Special" Grade

TRADE MARK REGISTERED IN NON-FLUID OIL UNITED STATES PATENT OFFICE

the transmission lubricant which has set a standard of lubrication never approached by any other.

Do not mix oil and grease in your transmission when you can get this lubricant of ideal consistency. It quiets and protects the gears and perfectly lubricates the ball and roller bearings in the transmission. One filling suffices for thousands of miles.

Ask your dealer. Free sample upon request.

New York & New Jersey Lubricant Co.
165 BROADWAY, N. Y.
Chicago: 1430 Michigan Ave. Phila.: 1431 Vine St.

Take Care of Your Motor Insist Upon— America's Leading Lubricants

HARRIS

TRADE MARK REG. U.S. PAT. OFF.

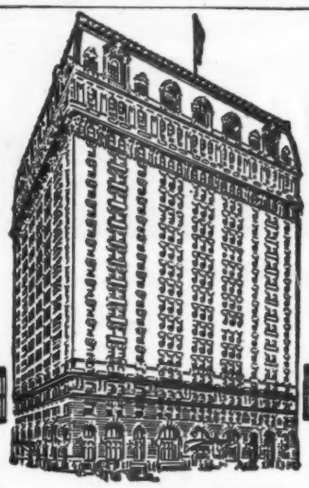
OILS

Motorists who demand the right oil preserve their motors. HARRIS OILS have been right for 28 years.

"A Little Goes a Long Way and Every Drop Counts"

If your dealer does not sell HARRIS OILS, send us 80 cents for 1 gal. can, or $3.75 for 5 gal. can, and we will send same prepaid.

A. W. HARRIS OIL CO.
326 S. Water St., Providence, R. I.
143 No. Wabash Ave., Chicago, Ill.



Hotel La Salle

CHICAGO'S FINEST HOTEL

ERNEST J. STEVENS, Vice-Pres. and Mgr.

Located in the heart of the city, within easy reach of all railway terminals

RATES

ONE PERSON	Room with detached bath	$2 to $3 per day
	Room with private bath	$3 to $5 per day
TWO PERSONS	Room with detached bath	$3 to $5 per day
	Room with private bath	$5 to $8 per day

TWO CONNECTING ROOMS WITH BATH

Two persons	$5 to $ 8 per day
Four persons	$8 to $15 per day
SUITES	$10 to $35 per day

LA SALLE AT MADISON STREET, CHICAGO

U-S-L

U-S-L

Takes the Place of the Fly-Wheel

The **U-S-L Electric Starter and Lighter** is a combination motor and generator that takes the place of the fly-wheel. The armature of the motor-generator is bolted directly to the engine crank-shaft.

The U-S-L doesn't add a single extra moving part to a car.

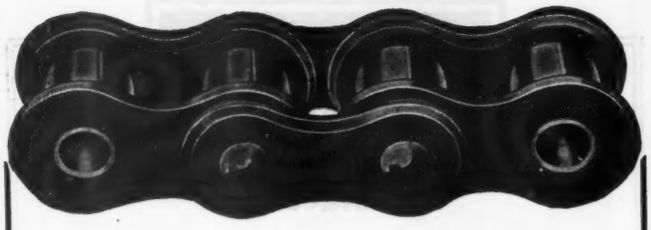
No gears or chains
No added weight
No bearings to oil
No extra clutches
Starts at a push of foot-button
Supplies ample current

Adopted by
Rambler, Overland, Garford, Edwards-Knight, Moyer, S. G. V.

Write for Bulletin 501

The U. S. Light & Heating Co.
General Offices: 30 Church St., New York

Branch Offices and Service Stations—New York, Boston, Buffalo, Cleveland, Detroit, Chicago, St. Louis, San Francisco.



BALDWIN Chains and Sprockets

run well together; made in a completely equipped plant with an organization skilled in the art by long experience. Manufacturers should have samples and prices of our chains, and allow us to quote on their blue prints for sprockets before placing their 1913 orders. We are prepared to furnish sprockets for replacements for all standard and commercial cars.

H. V. GREENWOOD, 122 So. Michigan Blvd., Chicago, Ill. C. J. IVEN, Rochester, N. Y. M. A. BRYTE, 788 Mission St., San Francisco, Cal. C. D. SCHMIDT, 416 Broadway, New York City. F. SHIRLEY BOYD, 393 Boylston Street, Boston, Mass. AUTO EQUIPMENT CO., Denver, Colo.

Solar system of auto necessities. Solar plexis to auto perplexities.

Carried and recommended by every well equipped garage and supply house.

SE-MENT-OL—Self acting radiator cement.
CARBONOX—Quick & efficient carbon remover.
NEVER-RUST—Chemically correct rim paint.
BRASS-KOTE—Air drying brass enamel.
TIRE-LAC—Chemically correct tire paint.

When you see that sign, buy the whole line.

THE NORTHWESTERN CHEMICAL Co.
Marietta, Ohio.

A reliable Electrical Measuring Instrument indicates quality.

Weston Model 267 Dashboard Ammeter.

WESTON AMMETERS

for control of **Electric Lighting and Self-starting Systems** are the most reliable, durable and highest grade instruments made for this purpose.

Please send for our 30-page bulletin No. 8 describing them.

Weston Electrical Instrument Co.

NEWARK, N. J.

New York	Boston	Denver	Birmingham	Montreal
Philadelphia	San Francisco	Cleveland	Toronto	Paris
Chicago	St. Louis	Detroit	London	Berlin

WHEN YOU BUY AN AUTO TRUNK

Look for the Red and Gold "Diamond K" on the Front

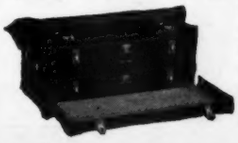
The red and gold trade-mark shows that it's a genuine Kamlee, the handsomest, strongest, most convenient auto trunk ever made.

Light and flexible, yet tough and durable in the extreme, it fulfills every requirement of the touring motorist. New air-tight, inter-locking edge makes

THE NEW KAMLEE

The Only Really Dust-Proof and Rain-Proof Auto Trunk

on the market. The edges lock together—rain or dust cannot enter anywhere. A rubber tubing at bottom of interlocking groove conforms to any irregularity or give in top and front. Contents thoroughly protected in any weather. Waterproof covering is fastened over top with patent spring-swivel nuts. No straps to bother with in opening. See it at your dealers or write us for prices and descriptive booklet. We'll gladly send you a *Kamlee on approval* anywhere if your dealer can't supply you.



THE KAMLEE COMPANY

236 Broadway **Milwaukee, Wis.**

Settled

The Cleaning Question

Old Dutch Cleanser routs out dirt in a jiffy — quickly removes rust — cuts cleaning costs, time and labor as well as grease and grime. "Settles" the cleaning question.

Fine for cleaning steel, copper, brass, iron and nickle-plated metals, floors and floor coverings, lavatories and wash bowls, painted walls and wood work. Contains no caustic or acids. Buy and try a can or two.

Many Uses and Full Directions on Large Sifter-Can—10c.

CONNECTICUT

SHOCK ABSORBERS

Are Indorsed by Leading Manufacturers

In 1911 only one make of car was regularly equipped with Connecticut Shock Absorbers. In 1912 the number had grown to six and in 1913 Connecticut Shock Absorbers are standard equipment on the following twelve makes —and these include the one which adopted them in 1911 and the entire six which adopted them in 1912:

Alpena	F.I.A.T. Six	Matheson
American	F.I.A.T. (Italy)	Norwalk Six
Dorris	Knox	Pierce-Arrow
Edwards-Knight	Kissel	Russel-Knight (Canada)

In addition to these manufacturers who supply Connecticut Shock Absorbers as regular equipment, there are a number who equip with "Connecticut" whenever shock absorbers are specified.

Connecticut Shock Absorbers are sold on 30 Days' Free Trial and are installed on any car at *our* expense anywhere in the United States.

Write for Bulletin No. 42.

Connecticut Shock Absorber Co., Inc.
Meriden, Conn.

MAYO SPARK PLUG PUMP

$10 ...cute for any spark-plug. The motor does the work, fills the largest tire with pure, fresh air in from 2 to 3 minutes. Built with metal rings like a motor and will last as long. Adaptable to all size cars from the smallest Ford to the largest Lozier. Weight 2½ lbs. Complete with 12 ft. of hose and connections. Price, $10.00. With pressure gauge, $2.00 extra.

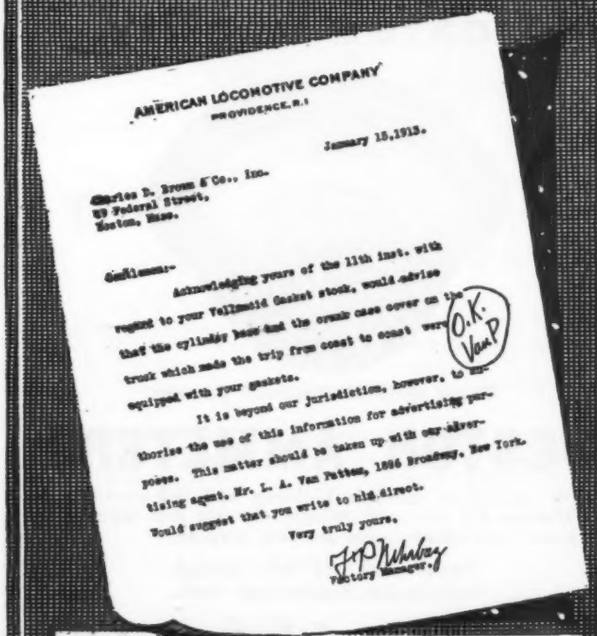
Mayo Mfg. Co.
51 East 18th Street
CHICAGO, ILL.

Try It FREE on Your Car For 30 Days

—

Write Us

VELLUMOID


AMERICAN LOCOMOTIVE COMPANY
PROVIDENCE, R.I.
January 15,1913.
Charles D. Brown & Co., Inc.
49 Federal Street,
Boston, Mass.
Gentlemen:-
Acknowledging yours of the 11th inst. with
regard to your Vellumoid Gasket stock, would advise
that the cylinder head and the crank case cover on the
truck which made the trip from coast to coast were
equipped with your gaskets.
It is beyond our jurisdiction, however, to au-
thorize the use of this information for advertising pur-
poses. This matter should be taken up with our adver-
tising agent, Mr. L. A. Van Patten, 1886 Broadway, New York.
Would suggest that you write to him direct.
Very truly yours,
Factory Manager.
O.K. Van P

CHARLES D. BROWN & CO., Inc.
Managers of Sales
49 FEDERAL STREET, BOSTON, MASS.

Basket-*Insurance* against *HUNGER* en route!

A small piece of ice in a Hawkeye Refrigerator Basket keeps lunch and bottles cool all day. An outdoor lunch from a "Hawkeye" is truly delightful—doubles the pleasure of your auto trip, rids you of disappointing road house meals! Our free booklet tells all you want to know about outdoor lunches.

The Hawkeye "Tonneau" Refrigerator Basket

The Hawkeye "Tonneau" Basket—Made of strong rattan finished in beautiful forest green; inside lined with heavy, non-rustable nickel plate surrounded with asbestos wall. Ice compartment detachable; made of nickel-plated zinc. Basket is insect and dust-proof. Hawkeye Refrigerator Baskets range from $4 up.

"A rest and a **Hawkeye** *add zest to the trip"*

Hawkeye Fitted Lunch Basket

Refrigerator Baskets

The Hawkeye Fitted Lunch Basket—A full-fledged dining outfit, containing coffee pot, saucepan, plates, cups, knives, forks, spoons, etc. A complete luncheon outfit for large outing party.

Write!

Ask for Free Book—tells all about Hawkeye Refrigerator Baskets — gives prices also—contains recipes for outdoor dishes. We send you name of "Hawkeye" dealer in your community. Write now, while you think of it.

DEALERS: Get our Proposition!

The Burlington Basket Company
66 Main St., Burlington, Ia. 2

Shofo

When your hands are all greasy and grimy from work, you revel in a wash-up with

For autoists, machinists, painters, printers and others whose hands get dirty.

SHOFO, the Hand Cleanser

It is a wonder-worker for all who get dirty hands. Shofo reaches the oil and dirt in the pores. Gently scours the fine lines. *Cleans* the hands. Keeps the skin soft and smooth. Shofo is compounded of pure castile soap, pulverized pumice stone and rich, green olive oil. Sold in pound and half-pound cans.

Try it—FREE

If you can't buy Shofo, send your dealer's name and address and we will send you Free Sample and booklet.

JOHN T. STANLEY, Maker of Fine Soaps
664 West 30th St., New York City

How Old Style Tanks Waste

Gasolene stored above ground fluctuates with the temperature—15 to 20° every twenty-four hours. The fluctuation causes vapor to form in the container for the same reason that mist or fog forms on a body of water.

You cannot prevent this vapor from forming as there is no "air-tight" above ground container. This vapor is the driving power of your gasolene.

Get All The Gasolene You Pay For

Store it underground where the temperature hovers close around 57° all the year round. Gasolene is too high priced to waste.

As Good As An Insurance Policy

A Bowser System is made to conform to that measure of safety prescribed by the National Board of Fire Underwriters.

Write for our interesting free illustrated book and we will tell you where you can examine a Bowser Outfit and see for yourself its economy and convenience.

S. F. BOWSER & CO., Inc.

Home Plant and General Offices

Box 2117, Ft. Wayne, Ind.

Sales Offices in all Centers and Representatives Everywhere.

Original patentees and manufacturers of standard, self-measuring, hand and power driven pumps, large and small tanks, gasolene and oil storage systems, self-registering pipe line measures, oil filtration and circulating systems, dry cleaner's systems, etc.

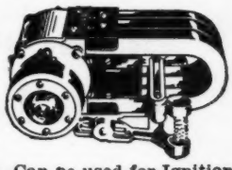
Established 1885.

IMPROVE THE APPEARANCE AND EFFICIENCY OF YOUR CAR BY INSTALLING THE

K-W Electric Headlight Outfit, $40

Complete Outfit, Generator, Head Lamps, Switch, Wire and Bulbs

EASY TO INSTALL ON ANY CAR having exposed flywheel or other place to drive the Generator.



LIGHT WEIGHT Generator weighs but 18 lbs. Compare it to the heavy, complicated and costly charging outfits. If you have the Electric Head Lamps, get the K-W Electric Generator, only **$25.** Can be used for Ignition in connection with Timer and Spark Coil.

HANDSOME MADE-FOR-THE-PURPOSE HEAD LAMPS. The Reflectors are set in the door against a felt ring to keep out dust and moisture. They are made of correctly formed brass heavily silvered and highly polished on the reflecting surface. Lamps alone $15 and $17. No extra charge for black finish.

K-W Ford Electric Headlight Outfit, $15

For Ford Cars With Flywheel Magneto

The successor to the gas tank. The most successful electric headlight outfit for Ford Cars, because it is especially designed and engineered to work in connection with the Ford Flywheel Magneto.

THE K-W IGNITION Co

2833 CHESTER AVENUE CLEVELAND, OHIO. U.S.A.

We make the famous K-W Master Vibrator

THE STANDARD BY WHICH ALL OTHERS ARE JUDGED

"Imperial XII" Belted and Water Cooled—Made in Three Sizes

"Imperial XII" Garage Compressors

Chiefly distinctive of "Imperial XII" Compressors is their ability to "stay on the job"—their ever-readiness for ample service.

This quality—which is the most valuable feature in any compressor—results from the fact that each "Imperial XII" represents the "know how" of the oldest, largest and most responsible builders of air compressors in the world.

Each "Imperial XII" must help maintain the reputation for high-duty, economical service which has become inseparably associated with the name "Ingersoll-Rand."

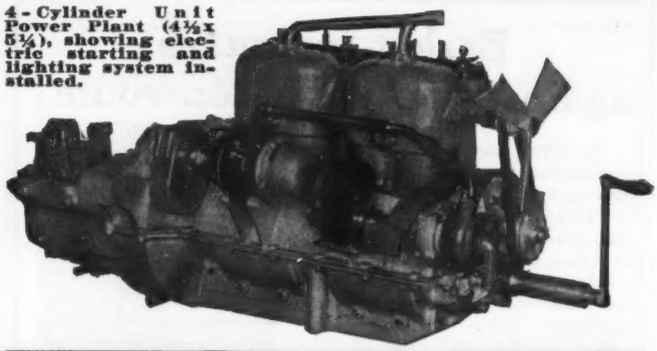
ASK YOUR DEALER.

INGERSOLL-RAND CO.

NEW YORK LONDON

OFFICES THE WORLD OVER

"Imperial XII" Tire Pump—Air Cooled and Motor Driven



4-Cylinder Unit Power Plant (4½x5¼), showing electric starting and lighting system installed.

Milwaukee MOTORS Will Solve Your 1914 Power Plant Problems

You will find somewhere in the complete line of MILWAUKEE MOTORS an ideal power plant for **your** car. You will find a motor whose features begin where those of other motors leave off—a 1914 motor down to the last tiny bolt.

MILWAUKEE MOTORS are made in all sizes for all requirements—6-cylinder pleasure cars—4-cylinder pleasure cars—light trucks—heavy trucks. Every motor is especially adapted to the kind of service to which it is to be put.

Furnished as Unit Power Plants or without transmission, clutch and control. Built to accommodate any standard transmission. Can be equipped with any standard electric lighting and starting device.

MADE IN THE FOLLOWING SIZES.

4-CYLINDER MOTORS

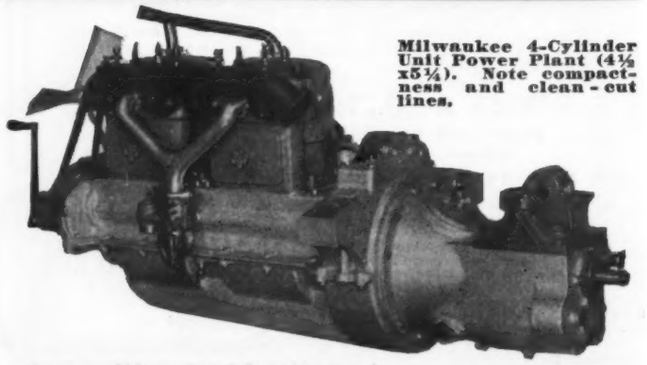
4 5/16x4¼. Unit Power Plant or Alone, Cylinders Cast in Pairs.
4½x5¼. Unit Power Plant or Alone, Cylinders Cast in Pairs.
4¾x5¼. Unit Power Plant or Alone, Cylinders Cast in Pairs.
4¾x6. A Special Truck Motor. Cylinders Cast in Pairs. Not furnished as Unit Power Plant.
4½x5½. Unit Power Plant or Alone, Cast en Bloc. For Pleasure Cars and Light Trucks.

6-CYLINDER MOTOR

4¼x5½. Unit Power Plant or Alone, Cast en Bloc.

Write for descriptive matter

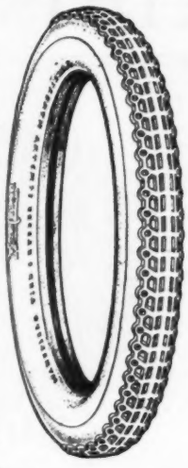
Milwaukee Motor Co., Milwaukee, Wis.



Milwaukee 4-Cylinder Unit Power Plant (4½x5¼). Note compactness and clean-cut lines.

Cable-Structur Tires—& Why

Dealers, your business success depends upon your service to customers, doesn't it? The merchandise you sell must give satisfaction or you lose trade. That law holds true in all lines. You can't afford to sell any tire but the BEST. Mansfield Cable-Structur is that tire. Here are the reasons WHY it is best and WHY YOU SHOULD SELL CABLE-STRUCTUR:



Unlimited in Quality

First we build unlimited quality into Cable-Structur tires. We use only the highest quality materials. Only fabric that will test at least 325 pounds per square inch, and this fabric is so woven as to permit of complete impregnation of new rubber.

And we use only the finest new rubber. This is given greatest endurance by our secret formula.

Unbreakable Base

24 endless, no-stretch steel wires, 12 on each side, are vulcanized into the semi-hard rubber beads. This gives the most logical tire base—and absolute safety.

These 24 wires give a tensile strength of 16,800 pounds.

Saving Rim Ruin

This basal construction makes a hooked base unnecessary. So the flange hooks are turned from the tire. Therefore no rim-damage is done if the tire is run soft, from any cause.

More Carrying Power

This compact Cable-Structur base gives greater air space. That gives the tire greater carrying power, that saves blowouts and their costs.

Careful Hand Building

Our careful hand building insures utmost exactness. Every inch of fabric is applied with unvarying precision. That means uniform strength.

Built Slowly

Cable-Structur tires are built very slowly. It costs us more—cuts our profit, but it insures perfect, flawless tires, and cuts the users' cost.

Experts Paid By Hour

Only expert tire men—men of long experience—build Cable-Structur tires. To avoid all rushing or slighting of work we pay our men by the hour, at highest wages.

So you see there is nothing uncertain about Cable-Structur.

No-Skid Tread

The No-Skid Tread is doubly effective—it has scores of high projections to grip the road, and scores of vacuums to hold on smooth pavements. And below the no-skid tread is a thick plain tread to add great mileage. Both are very tough, and wear resisting. The two give great mileage.

Tested 30,000 Times

More than 30,000 have been tested by motorists, and now the demand calls for our utmost capacity.

The replacement of Cable-Structur tires is but six-tenths of one percent, with our rigid 3,500 mile guarantee.

The average mileage of a large percent is between 7,000 and 12,000 miles.

Can you ask more evidence?

Control the Sale

Place your order now, corral the demand for this tire, and you can control the sale.

We'll stay with you. We'll help you sell Cable-Structur Tires. Write today for our special proposition (106).

Mansfield CABLE STRUCTUR

The Mansfield Tire & Rubber Co., Mansfield, O.

$1.50 postpaid, or from your dealer.

HERZ PLUG

"Bougie Mercedes"
is the

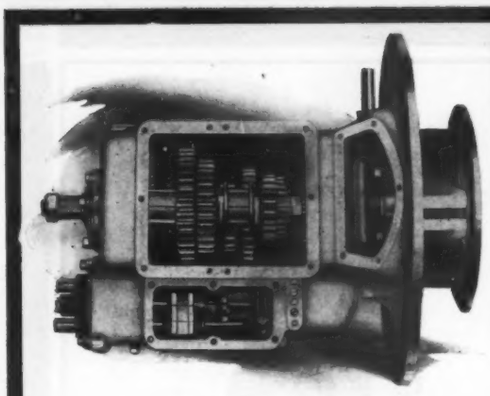
Standard High-Grade Plug of the World

One great point of overwhelming superiority in HERZ PLUGS is the unbreakable Double-Stone Insulation, which replaces the porcelain of ordinary plugs. The inner stone is ground into the steel fitting, without packing. The outer stone is Blue Enameled, a feature by which HERZ PLUGS can readily be recognized.

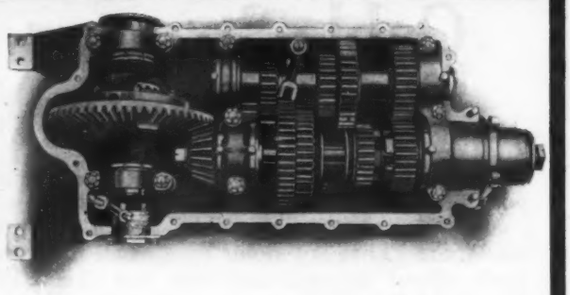
Other important Herz features are the Four Sparking Points, the Platinum-alloy Electrode, and the Self-cleaning construction. Every Herz Plug is

Guaranteed a Full Year

HERZ & CO., 295 Lafayette St., New York
Makers of the HERZ MAGNETO



In our engineering department we employ the most competent engineers and draftsmen that we can possibly find, they being selected and employed only after a thorough investigation as to their individual mechanical and engineering ability. Our engineering department is your engineering department. We are ready at all times and shall deem it a pleasure to serve you and your ideas. Write us today.

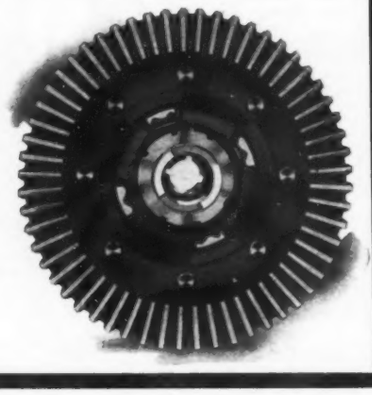


"THE ORIGINAL"

WARNER GEAR CO.

MUNCIE INDIANA

Detroit Office—628 Ford Building



"Soot-Proof" Spark Plugs Never Balk—Over 2,000,000 Prove It

Not all spark plugs will carbonize.
Not all get dirty, grow weak or short circuit.
And not all spark plugs call for frequent replacement.

Mr. C. A. Mezger—after twelve years spent on spark plug problems—has perfected and patented the "Soot-Proof" plug.

This plug is warranted to clean itself. It never clogs, never leaks, never short-circuits. And it lasts for years.

Its use forever ends all spark plug worries.

It is built with a double chamber. Thus it offers at least **three times** the resistance of any other spark plug made.

It outlasts any other by two or three times over.

This has all been proved to hundreds of thousands. For over two million "Soot-Proof" plugs are now in use on the leading cars of America.

One "Soot-Proof" plug will prove this to you. If you have any doubt, use old-type plugs with it. Note the difference in results.

Do this now. Think what it means to have spark plug troubles forever wiped out. This spark plug will do it—that is guaranteed.

Get them from your dealer. If he can't supply, find a dealer who can. Or send to us direct. In replacements alone these "Soot-Proof" plugs will save many times what they cost you.

C. A. Mezger "Soot-Proof" Spark Plugs

C. A. MEZGER, Inc., 15 Canal Place, New York

Philadelphia, 1427 Vine St., Petry-Cassidy, Inc.
Chicago, 1430 Michigan Boulevard, F. E. Sparks
Detroit, Ford Building, H. E. Butcher
Portland, 329 Ankeny St., Hughson & Merton
Seattle, 924 E. Pike St., Hughson & Merton
Los Angeles, 1229 So. Olive St., Hughson & Merton
San Francisco, 530 Golden Gate Ave., Hughson & Merton

70% of the winners in the 500-mile Indianapolis Race used Bosch Plugs.

You Ought to Use Bosch Plugs

BOSCH Plugs were designed with a degree of perfection, equal to that of the Bosch Magneto, the most extensively used ignition source in the world.

In making Bosch Plugs it is the intention to provide the best possible spark plug that can be made; one which would eliminate every doubt as to its worth; a spark plug that especially appeals to post graduate motorists, men who know and buy accordingly.

Bosch Plugs are $1 00 EACH at all good dealers

BOSCH MAGNETO CO., 220 West 46th St., New York
Chicago :: Detroit :: San Francisco :: Toronto
OFFICIAL DISTRIBUTORS IN ALL IMPORTANT CENTERS

Stanley's Auto Door Hinges

Made of Special Analysis Cold Rolled Steel, the product of our own rolling mills.

THE STANDARD LIST OF SIZES

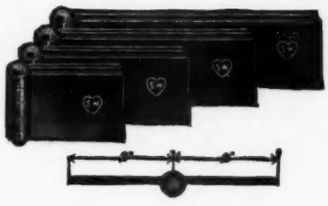
SIZE WIDTH INCHES	GAUGE	LENGTH INCHES
2" Regular	No. 9	2, 3, 4 and 5 inches
2" Extra Heavy	No. 8	2, 3, 4, 5 and 6 inches
1¾" Regular	No. 10	2, 3 and 4 inches
1¾" Extra Heavy	No. 9	2, 3, 4 and 5 inches
1½" Regular	No. 9	2 and 3 inches

The 1½" has three knuckles in the joint, larger sizes five. Screw holes punched and countersunk to meet specifications.

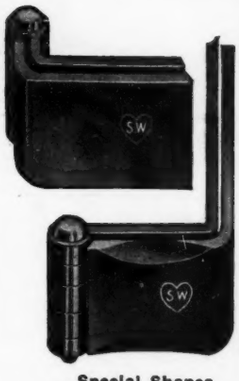
Send us specifications for your 1914 cars and let us submit samples and prices.

Manufactured by

The Stanley Works
New Britain, Conn.
73 E. Lake Street, CHICAGO
100 Lafayette Street, NEW YORK



The Cross Section shows the standard system of measurements. The dimensions are taken from the center of the joint to the outer edge of the leaf.



Special Shapes Produced to Order

Offset pattern

Straight pattern

Reversed Joint Semi-Concealed Barrel

These Hinges are particularly suitable for use on closed cars.

SPLITDORF

"Always There"

Investigation by Commission

may have its advantages from a Congressional standpoint, but PERSONAL INVESTIGATION cannot be surpassed as a means of obtaining a real intimate knowledge of the superior qualities of SPLITDORF SPARK PLUGS.

And SPLITDORF PLUGS will come through any and every personal investigation—no matter how thorough, or how searching—with the unqualified endorsement of: "THE BEST SPARK PLUG ON THE MARKET."

There's no dodging the issue—the SPLITDORF ELECTRICAL COMPANY is bigger and better than ever—it GUARANTEES ITS PRODUCT and stands committed to every claim it makes for the goods bearing its trademark.

A PERSONAL INVESTIGATION TO-DAY will convince the most skeptical that the SPLITDORF SPARK PLUG, with the hexagonal porcelain, and with the SPLITDORF trademark, stamped on the shell, is the common-sense plug for every-day usage—gas-tight, soot-proof and unbreakable.

Remember, All! "New ignition for old" is our slogan—we have a SPECIAL EXCHANGE proposition of the greatest interest to every owner of a gasoline motor who would save time and money. Write or call TO-DAY for particulars.

SPLITDORF ELECTRICAL COMPANY

ATLANTA, 8 Harris St.
BOSTON, 180-182 Mass. Ave.
CHICAGO, 64-72 E. 14th St.
DETROIT, 972 Woodward Ave.
KANSAS CITY, 1823 Grand Ave.
LOS ANGELES, 1228 S. Olive St.
NEWARK, 290 Halsey St.
NEW YORK, 18-20 West 63rd St.
PHILADELPHIA, 210-212 N. 13th St.
SAN FRANCISCO, 1028 Geary St.
SEATTLE, 1628 Broadway.
LONDON BUENOS AIRES

FACTORY, NEWARK, N. J.

Starts — Lights — Ignites

REMY

Six Volt System—Does-It-All

WE are the only factory able to assume complete responsibility for the *entire* efficient electrical equipment of your product. Remy apparatus is furnished as a whole—or in any combination. The Starting and Lighting equipment is furnished to manufacturers only.

Risk of obsolete equipment is eliminated; service demands of the individual owners are centered in one factory.

Because the Remy is a fourteen year old concern with a national service organization, you are guaranteed *permanent efficiency.*

Liberal magneto (any make) exchange offer.

Remy Electric Company

General Offices and Works, Anderson, Indiana

BRANCHES:
New York Detroit Kansas City Minneapolis
Boston Chicago San Francisco

(Service stations throughout the country.)

Put Motz Cushion Tires On Your Pleasure Electric

Then watch tire troubles disappear.

Then watch tire *up-keep* disappear.

And note, too, that Motz Cushion Tires make your electric comfortable and easy-riding. For we use the famous "417" rubber which costs 50 per cent. more per pound than the usual quality. And we use about 50 per cent. more *pounds* of rubber than is customary for tires of same rated carrying capacity. This extra-*quality* and extra-*quantity* of rubber combined with our patented construction (double treads, under-cut sides and slantwise bridges) gives a degree of resiliency found in no other tire except the pneumatic.

As for wear we guarantee 10,000 miles, 2 years. That's far beyond the pneumatic guaranty.

Don't buy new tires or a new electric car without first investigating the Motz Cushion Tire. Learn why this tire became King in its Domain. The reasons are set forth in an attractive Booklet which you can have on request. Write for the Booklet 56 today and get it by next mail.

A—Double treads.
B—Undercut sides.
C—Slantwise bridges.
D—Shows how tire absorbs shocks when going over an obstacle.

The Motz Tire & Rubber Co.

Factories and Executive Offices, Akron, Ohio

Service Stations in All Principal Cities

TOURING WITH THE

Stromberg Carburetor

Touring with a Stromberg Carburetor, whether a 100-mile Sunday drive or a 1,000-mile trip through the mountains, is free from carburetor worries.

A Stromberg Carburetor takes you over the roughest roads—through sand and mud—up steep hills—regardless of weather or altitude—all without a moment's thought from you.

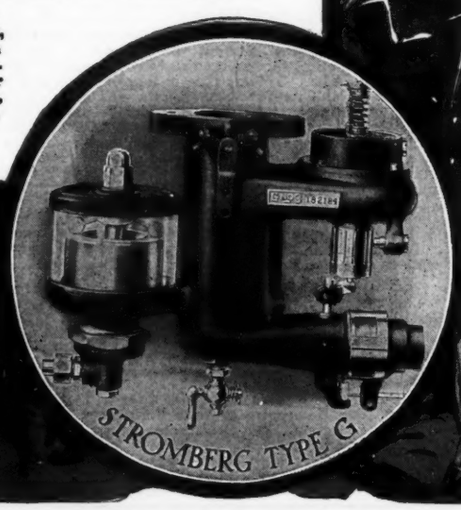
You will have power in abundance—low throttle—easy starting—fuel economy—regardless of grade of gasoline, if you use a Stromberg. Let us send you "Reasons Why," and complete information about the Stromberg New Type "G."

Stromberg Motor Devices Co. 56 E. 25th St. Chicago, Ill.

BRANCHES

New York Boston Detroit Indianapolis Minneapolis

Pacific Coast Distributors: Chandler and Lyon Co., Los Angeles, Portland, Fresno, Spokane, San Francisco, Seattle. Canadian Distributors: Russell Motor Car Company, Toronto, Montreal, Hamilton, Winnipeg, Calgary, Vancouver



Diamond Vitalized Rubber Tires
answer your demand for "More Mileage"

Our chemists have discovered a scientific process of toughening pure rubber.

All types of Diamond Tires are now made of Vitalized Rubber—a flint-like, road-resisting rubber that retains all the young, lusty vigor of the pure gum with no loss of elasticity.

Other Diamond Tire advantages are Perfect 3-Point Rim Contact, No-Pinch Safety Flap for inner tube protection and, if you wish, the now famous Diamond Safety (Squeegee) Tread.

So this time buy Diamond Vitalized Rubber Tires—you can get them to fit your rims at any of the

BE A DIAMOND DEALER
If you are not a Diamond dealer now is the time to get in line. There is a Diamond Branch near you—get in touch to-day.

25,000 Diamond Dealers always at your Service

NOW READY
OFFICIAL
Automobile Blue Book

Price $2.50 the Volume, Prepaid

Volume One—New York and Canada
What with the Empire State's recent $50,000,000 appropriation and constant public and private interest thruout the history of touring, our motorist-patrons rightly look to this volume to provide some of the finest trips to be found in the East. Volume One is thoroly remapped and rewritten to meet changed and improved conditions. Niagara, the various paths to and from the always-attractive Thousand Islands section, the Adirondacks and Catskills, the lakes and hills of Watkins Glen, the many highways along the Great Lakes, the smooth motor-ways of Long Island, are among the hundreds of trips offered.
One could spend an entire summer seeing New York State's far-spreading shores and mountains—and always in comfort, so extensive and well-operated are the hotels thruout the State.
The tourable roads in the Province of Ontario are extended wherever possible. And the inter-volume routes into New England (Volume Two), New Jersey and Pennsylvania (Volume Three) and Ohio (Volume Four) make the touring-connections as simple as in preceding issues.

Volume Two—New England and Maritime Provinces
New England (and one always thinks of the Canadian Coast at the same time) continues to be one of the most-toured sections of the country. To her splendid complement of mountain, lake and seashore attractions, New England enterprise has added the comfort of perfect highways and hotels. With this steady development Volume Two has more than kept step—the 1913 Edition embodying (in addition to the work of previous years) complete data on Fort Kent, Halifax, Maritime Canada, the White Mountains, Maine Coast, New Hampshire and the Berkshires. And in a section so full of historic interest, Blue Book notes naturally are especially full. Over one thousand pages.

Volume Three—New Jersey, Pennsylvania and the Southeast
Of special interest to the eastern motorist will be the new chartings on routes to the Water Gap, thru the mountains of Pennsylvania and to and from the Jersey Shore resorts. In the vast region of the southeast—where touring information is especially necessary—the tourist will find the volume a guiding hand in many a hitherto uncharted locality.
And this volume, in connection with Volume Five, offers a number of transcontinental trips. With the opening of connecting roads thru the Rockies such a trip has become not only possible, but a feasible and pleasant vacation jaunt for the truly-out-door motorist.

Volume Four—The Middle Western States
Herein are covered Ohio, Indiana, Illinois, Michigan, Wisconsin and Kentucky. In this district, motoring has accomplished more proportionate "good roads" development than in any other part of the country. Such a rate of progress has thrown a considerable burden upon the Automobile Blue Book Charting Staff. How well the field has been covered is revealed in Volume Four for 1913. Of new and hitherto uncharted routes, the volume contains 20,000 miles—more than the total new data of the past two years.

Volume Five—Mississippi River to the Pacific Coast
The "furthest-west" volume. Besides covering adequately the tourable roads between the Mississippi and the Rockies, this book includes all useful trunk-line connections between Chicago and Mississippi River points. The pioneer phase of this edition, however, is its presentation of the wonderful touring sections in the Rocky Mountain States. The Transcontinental Lines are brought up to date and there are added many important roads in Minnesota, South Dakota, Iowa, Missouri, Nebraska and Kansas.

For Sale at Book Department, THE AUTOMOBILE, 231 West 39th Street, New York City

Wanted! 10,000 Dealers

TO SELL Essenkay

"ENDS TIRE TROUBLES"

NO PUNCTURES NO BLOW-OUTS

We want to place a set of Essenkay installing tools into 10,000 automobile garages this season—we also intend to place Essenkay on sale in these 10,000 garages.

We want only "live wire garages"—those who can realize the possibilities for profit and big business in the sale of Essenkay.

We are rapidly putting the best garage people in the country in a position to sell and install Essenkay.

Ever since we changed our policy from an "exclusive" proposition to a "general" proposition orders and inquiries have been coming to us in sacks. These orders come from garage people all over America.

Most of them are from large towns. Now we want to give the garage people in the smaller towns a chance.

We have a "live wire" proposition for every garage dealer in the country. Write or telegraph if you want to get in on the greatest money making proposition in the automobile line.

Prices Reduced

The retail selling prices of Essenkay have been materially reduced. Thousands of owners who were practically sold last year, but who left price stand in their way, this year are going to get Essenkay because of the material reduction in its price.

Essenkay started out by using full pages and double pages in magazines like the Saturday Evening Post, Collier's, Everybody's Magazine, McClure's Magazine, the Automobile trade publications, etc. Inside of 30 days the company was swamped. Orders were received for more than 100 times as much Essenkay as the factories working 24 hours a day could make; no more agencies were established and dealers were asked to "ease up" on orders.

Now we have manufacturing facilities that will enable us to fill all orders promptly.

We have our storage shelves filled to overflowing with Essenkay that was made during the winter months, so come on with your orders. We'll agree to fill them all within 24 hours after their receipt by us.

Essenkay Is a Tire Filler

—Get that—a "tire filler"—and because Essenkay is a "tire filler"—and because it saves expense on tires, on tubes, on extra spare rims, tire irons, patches, vulcanizing, etc., etc., etc., it has been knocked—knocked hard, but in spite of "knocks" and the theories advanced by some who do not know the difference between an experiment and a proven success—it has had the greatest sale ever experienced by any automobile accessory and each day brings many adherents—new boosters.

Don't base your conclusions on theories, on arguments advanced by those who have an axe of their own to grind—get the facts and get them from the people who have ridden on Essenkay. Read the testimonial letters from good hard-headed business men who have used Essenkay in their pleasure cars as well as their trucks and don't forget that as long as there are automobile tires there will be Essenkay.

Essenkay Is Not a "Game"

It is a business. The manufacturers of Essenkay make many other things not used on automobiles—electrotyper's rolls, rubber substitute—time stamp pads, substitute pads for storage battery cases, etc.

The Doom of the Pneumatic Tire

Essenkay is the long-expected invention that signalizes the absolute abandonment of air in automobile tires and the consequent and final end of tire troubles due to air.

Essenkay sounds the doom of the pneumatic tire. It sounds the doom of the inner tube. It cuts the future cost of casings and creates a feeling of profound satisfaction and security that the public has not felt—nor had any right to feel—since the automobile was first invented.

Essenkay has added immeasurably to the pleasures of touring, for it removes the one great obstacle that has kept people at home. It has promoted cross country riding which has heretofore been prohibitive to thousands of salaried men because of the expense of tire troubles. It has been and will continue to be the greatest boon the automobile industry has ever known.

Essenkay Is Impervious to the Elements

Heat won't expand it. Cold won't contract it. It will not harden or oxidize or "bloom" or rot. Sudden changes in temperature have no effect upon it. You can suspend Essenkay in boiling water for an indefinite period of time and you will find that it has not imparted any of its properties to the water nor has the water affected it in the slightest degree. You can freeze it in a solid chunk of ice and at the end of a week, or a month, you can take it out without having injured it in the least.

Essenkay is a success. Any article that revolutionizes the world's comfort, the world's pleasure, and adds immeasurably to the world's mercantile advancement, service and efficiency, which preserves life, saves millions of dollars of expense for the people, can no more be held in check than the wonderful telegraph, telephone and electric light.

Write or wire for our dealers' proposition NOW!

ESSENKAY PRODUCTS CO.
1125B W. 37th Street Chicago, Ill.

NOBBY TREAD & CHAIN TREAD

In every season—for every kind of service—the famous "Nobby Tread" and "Chain Tread" are acknowledged to be the most effective automobile tires ever manufactured.

Insist upon them. Sold by reliable dealers everywhere

Manufactured by the

UNITED STATES TIRE COMPANY

800,000 In Use

There are now over 800,000 Stewarts in constant use—which is four times as many speedometers as all the other makes combined.

This statement is not published as a boast—but only to further emphasize the practicability of the *magnetic* principle.

If the *magnetic* Stewart was not the superior speedometer it could not have grown to be the most popular speedometer.

Such an increasing and indelible popularity is the most sincere and secure indication of satisfaction and success.

The Stewart Speedometer Factory
1930 DIVERSEY BLVD.
Chicago, U. S. A.

Service Stations in all important cities all over the world

Good Axles Will Boost Your 1914 Sales

THE splendid reputation of Metal Products, applied to your 1914 cars, will increase your sales and add to the good name of your cars.

For several years a number of the best known automobiles have given axle-satisfaction by using Metal Products axles.

We have open capacity for 1914 for axles for both gas and electric pleasure cars. We make only the highest grade products, ***guaranteeing materials*** and ***workmanship*** and make deliveries as you want them.

We can give you what you want, either in standard type axles or those built to your specifications. We make unusually high grade rear axles of the pressed steel housing type.

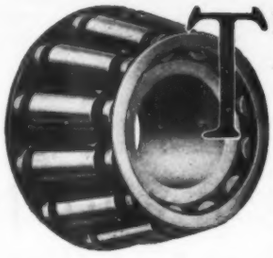
Stock axles for immediate delivery.

Take up your proposition with us before settling your contract.

Metal Products Company

Detroit, Mich.

The Accounting Department Must Justify Motor-Haulage



THE record will go down, black on white, in your books—day by day, week by week, year by year.

Will the balance be on the right side?

That depends on three things: No. 1—Does your business fit the truck? No. 2—Does the type of truck fit your business? No. 3—Will the truck stand up to the job after you get it? *Don't neglect No. 3.*

The first two have been studied and investigated, from every angle, put down in exact figures, settled definitely. *What's the answer to No. 3?*

Look to the parts that carry the load

When the giant truck rumbles past you over the cobblestones, don't look merely at the body, *look beneath.* That's where the load comes—on the axles and their bearings.

Take a five-ton truck, for example, it weighs about 8,000 pounds, its load, 10,000 more. *Nine tons supported by the four axle* spindles!

Only long years of experience and the devotion of an entire great organization to axle-building can safely determine the size and design of those spindles, the selection and heat treatment of the steel.

It is because Timken-Detroit Axles are made by such an organization that they are standing up under so many thousands of motor trucks today, both electric and gasoline driven.

750 lbs. on a 5/8-inch roller

The nine tons rest also on the 5/8-inch rollers in the eight Timken Bearings on the four axle spindles.

And not on all of the rollers at that, because only one-fifth of the 120 rollers in the eight bearings, or 24 rollers, are actually under the load at any one time.

Think of it, nine tons on 24 rollers. 750 lbs. on each!

But Timken Tapered Roller Bearings carry this load—what's more they take the tremendous side-pressure when corners are turned, the pound and jolt of the rough roads, the extra stresses due to careless driving.

All the conditions have been foreseen by Timken Engineers—and they have established a factor of safety far enough above the 750 lbs. to *make sure of emergencies.*

Building truck axles and bearings that stand up to the work

Timken Engineers have built on the experience of all motor-truck designers and builders, domestic and foreign.

They have minutely tabulated records of their own experience, going back before the first practical conception of motor-haulage.

Timken Engineers have at their service two great organizations whose only occupations and ideals are to build the best possible axles and bearings for pleasure and commercial cars.

They can help you answer that third question with a "Yes."

You will find the whole story of axle and bearing importance—for pleasure cars as well as motor trucks—in the Timken Primers No. T-1 "On the Care and Character of Bearings," No. T-2 "On the Anatomy of Automobile Axles." Sent free, post-paid, from either address below.

The Timken-Detroit Axle Co.
Detroit, Mich.

The Timken Roller Bearing Co.
Canton, Ohio

TIMKEN
BEARINGS & AXLES

Now in Their Fourth Big Season of Doubling and Redoubling Sales

THE mirror-like slippery pavement affords as sure a footing for the car shod with Vacuum Cup Tires as the fine, dry macadam road. Whether the surface is wet or greasy these tires are *guaranteed* not to skid, or are returnable at full purchase price after reasonable trial.

The thick-walled cups drive deep and give positive traction in mud. Discontent with tire *service* also ends abruptly with the adoption of

PENNSYLVANIA Oilproof VACUUM CUP TIRES

THEY are the heaviest tires of the rated sizes manufactured. Their construction is the strongest, their composition the toughest—and absolutely *oilproof*—immune from "oil disease." With each Vacuum Cup Casing goes a definite printed guarantee of

4,000 MILES

Their actual service mileage averages a far greater distance.

Important to Dealers: The handling of Vacuum Cup Tires is the smoothest, most satisfactory of all tire propositions, with particular reference to dealings with the consumer. Their unusual quality, their ready saleability, and the sound policy under which they are guaranteed and sold, put them in a class by themselves.

Pennsylvania Rubber Company, Jeannette, Pa.

Pittsburgh, 505 Liberty Ave.
Cleveland, 1837 Euclid Ave.
Minneapolis, 34 South 8th St.
Kansas City, Mo., 514 E. 15th St.
Detroit, 254 Jefferson Ave.
Chicago, 1004 Michigan Ave.
Seattle, Armour Bldg.
Omaha, 215 S. 20th St.

PENNSYLVANIA RUBBER COMPANY OF NEW YORK

New York City, 1700 Broadway
Boston, 149 Berkeley St.
Dallas, 2111 Commerce St.

PENNSYLVANIA RUBBER COMPANY OF CALIFORNIA

San Francisco, 512-514 Mission St.
Los Angeles, 930 South Main St.

NON SKID VC TRADE MARK REG. U.S. PAT. OFF.

An Independent Company with an independent selling policy.

We Are Careful of the Small Advertiser

The big ones take care of themselves. A magazine's success is first noised abroad by the small advertiser whose results are consistently good. The big fellows follow.

We claim that the average of The Literary Digest as tested in many lines of advertising is as high as that of any magazine published today and we are as much interested in making the 56 line shock absorber advertisement pay as we are in bringing results to the automobile double spread.

Total Number of Display Advertisements

January—May, 1913

S. E. Post		Literary Digest		Cosmopolitan		Collier's	
January	454	January	379	January	282	January	295
February	464	February	468	February	380	February	308
March	664	March	612	March	358	March	390
April	624	April	492	April	423	April	326
May	593	May	528	May	412	May	374
1913 Total	2,799	1913 Total	2,479	1913 Total	1,856	1913 Total	1,693
1912 "	3,382	1912 "	2,276	1912 "	1,749	1912 "	1,929
		Gain	203				

We seek automobile advertising as a class publication with a mass interest. It is the combination that makes us a great advertising medium. Natural circulation at a $3.00 subscription price and the number, 280,000, gives us a value that cannot be duplicated.

The Literary Digest

45%	Digest	circulation	in	cities	100,000	and over
5%	"	"	"	"	50,000	to 100,000
6%	"	"	"	"	25,000	" 50,000
8%	"	"	"	"	10,000	" 25,000
7%	"	"	"	"	5,000	" 10,000

Mosler Spit Fire Plugs

Lead Again

TO THE TRADE:

Write for this valuable booklet giving the correct style of plug best suited to the engines of the cars now in use

Mr. CONSUMER:

Write us for the correct size and style plug best suited to the engine of your car

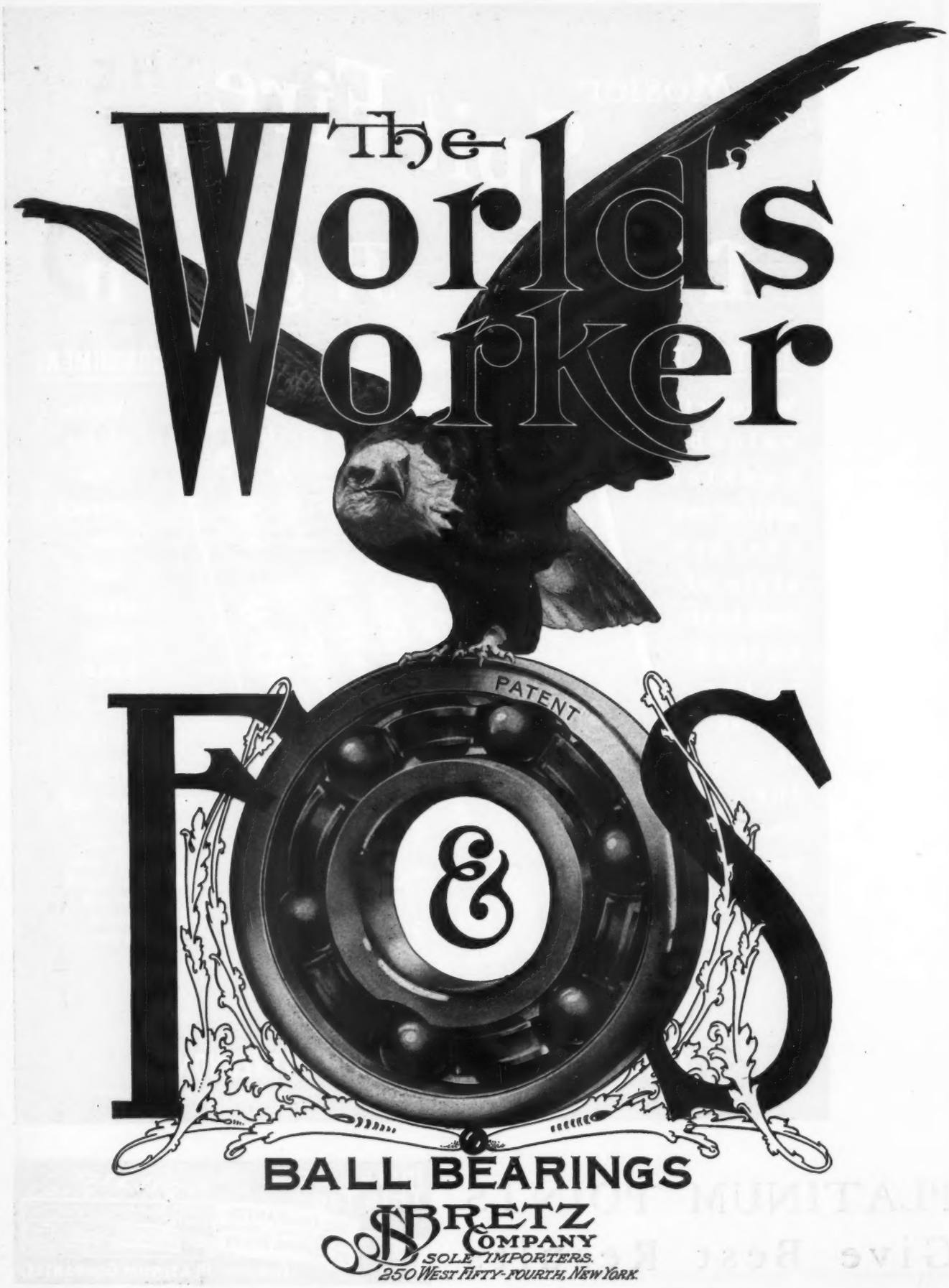
The Plug that will give mileage, speed, power and continued satisfaction

A. R. MOSLER & CO., P.O. BOX "M" MT. VERNON, N.Y.

WE OWN THE LARGEST FACTORY IN THE WORLD DEVOTED EXCLUSIVELY TO THE MANUFACTURE OF SPARK PLUGS

PLATINUM POINTS Give Best Results

Insist Upon This Tag
Mosler Spit Fire Plugs
WE GUARANTEE THAT THIS PLUG HAS A GENUINE PLATINUM POINT
GENUINE PLATINUM GUARANTEED


The World's Worker
PATENT
F & S
BALL BEARINGS
BRETZ COMPANY
SOLE IMPORTERS
250 WEST FIFTY-FOURTH, NEW YORK

THE TUTO HORN

Now the Tuto Horn Is Within the Reach of Every Car Owner

Improvements and Manufacturing in Large Quantities make it possible to furnish the Genuine $25.00 TUTO for $15.00

This new price includes all of the Exclusive features that have made the TUTO horn so practical and popular :

Two-tone Feature—low note for regular service—loud note for emergencies—from the one horn and one button.

Instantaneous Action—No loss of time for motor to "speed up."

Steering Wheel Fixtures—Protects the cord—Gives neat, permanent job.

Button always under Thumb—Gives quick action in case of emergency.

Automatic Operation—Unconscious gripping of button upon approach of danger forces button clear down and gives **loud note—instantaneously.** No hesitating, no selecting of horn buttons, etc.

Reliability—Always responsive, as same button, cord and horn are used for both notes, thus are self-testing. There is nothing to oil or clean, so neglect will not interfere with operation or ruin the working parts, the same as in **mechanical** or **motor** horns.

Liberal Guaranty—Guaranteed indefinitely against inherent defects or breakage of parts due to such defects. We always give the customer the benefit of the doubt.

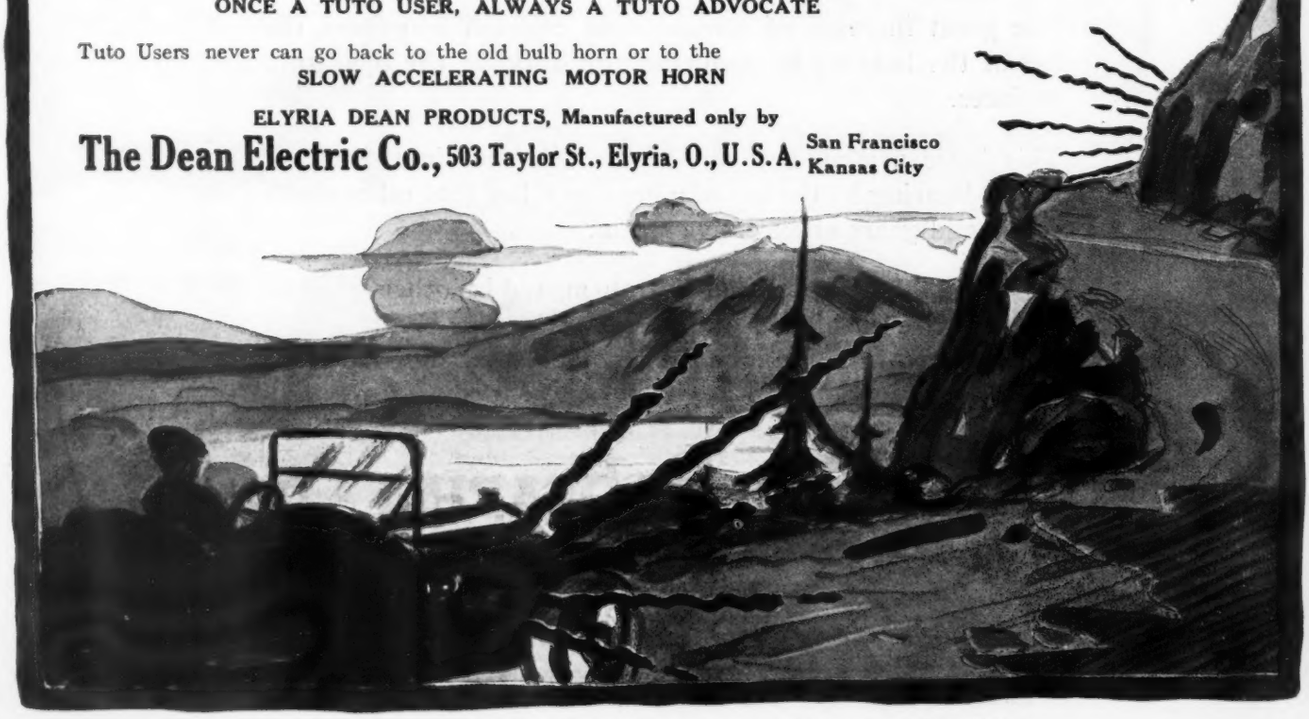
No Experiment—The Tuto Horn has been marketed for three years and has given unusual satisfaction through its reliability and freedom from trouble. This is proven positively by our records, which **show** that we have been called upon by less than 1% of Tuto owners for advice or repair parts.

ONCE A TUTO USER, ALWAYS A TUTO ADVOCATE

Tuto Users never can go back to the old bulb horn or to the
SLOW ACCELERATING MOTOR HORN

ELYRIA DEAN PRODUCTS, Manufactured only by

The Dean Electric Co., 503 Taylor St., Elyria, O., U.S.A. San Francisco Kansas City



ANOTHER PROMINENT USER OF HYATT ROLLER BEARINGS

G. A. MATHEWS, Pres. & Gen. Mgr.
Jackson Automobile Co.

HYATT QUIET BEARINGS

Line Contact vs. Point Contact

The fundamental advantage of the Roller Bearing over the Ball Bearing lies in the fact that it has a line of contact as against the point of contact of the ball bearing.

The great increase of contact thus effected lengthens the life of the bearing by reducing the duty on the operating surfaces.

This basic principle is carried even farther in the Hyatt Roller Bearing by the use of a flexible roller that relieves the shafts and gears of excessive strain.

Vibrations that are ordinarily transmitted by other types of bearings are cushioned and absorbed by the Hyatt. It is this feature of the Flexible Roller that reduces noise.

HYATT ROLLER BEARING CO.
DETROIT, MICHIGAN
WORKS, NEWARK, NEW JERSEY

Mr. Dealer the demand now exists for KNOWLSON'S SPRING LEAF SPREADER

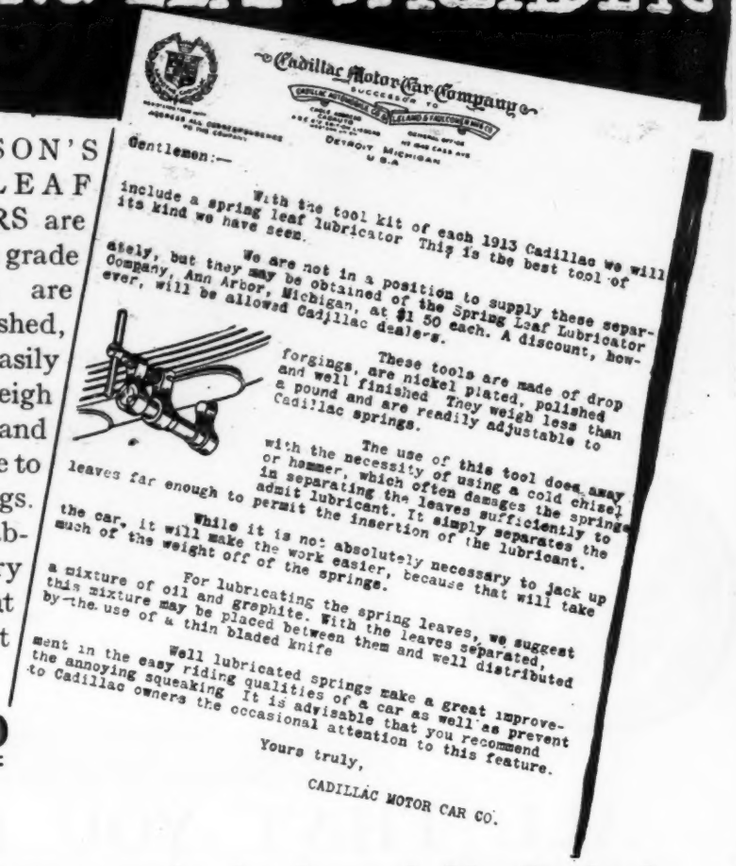
The Most Useful Tool in the Automobile Field to-day

KNOWLSON'S SPRING LEAF SPREADERS are made of high grade drop forging, are nickel plated, polished, and well finished, fit easily into the tool kit, weigh less than a pound, and are readily adjustable to any automobile springs. Guaranteed to be absolutely satisfactory or money back. Sent prepaid upon receipt of price—

$1.50

This is the tool

This is the way it works



Cadillac Motor Car Company
SUCCESSOR TO
DETROIT MICHIGAN U.S.A.

Gentlemen:—

With the tool kit of each 1913 Cadillac we will include a spring leaf lubricator This is the best tool of its kind we have seen.

We are not in a position to supply these separately, but they may be obtained of the Spring Leaf Lubricator Company, Ann Arbor, Michigan, at $1 50 each. A discount, however, will be allowed Cadillac dealers.

These tools are made of drop forgings, are nickel plated, polished and well finished They weigh less than a pound and are readily adjustable to Cadillac springs.

The use of this tool does away with the necessity of using a cold chisel or hammer, which often damages the springs in separating the leaves sufficiently to admit lubricant. It simply separates the leaves far enough to permit the insertion of the lubricant.

While it is not absolutely necessary to jack up the car, it will make the work easier, because that will take much of the weight off of the springs.

For lubricating the spring leaves, we suggest a mixture of oil and graphite. With the leaves separated, this mixture may be placed between them and well distributed by the use of a thin bladed knife

Well lubricated springs make a great improvement in the easy riding qualities of a car as well as prevent the annoying squeaking It is advisable that you recommend to Cadillac owners the occasional attention to this feature.

Yours truly,

CADILLAC MOTOR CAR CO.

Will you supply the demand, Mr. Dealer?

Motorists are now recognizing that the vital points demanding lubrication are the leaves of the springs. Heretofore it has been necessary to use a cold chisel and hammer to pry apart the springs. Not only was this method exceedingly troublesome, but it was damaging to the springs.

Now—with the KNOWLSON SPRING LEAF SPREADER—lubricating the leaves of the springs is as simple as lubricating any other part of the car. It does the work with the least expenditure of time and energy. It will sell almost upon sight to your customers. You should stock them today. It retails for $1.50. There is a mighty good profit in it for you.

SPRING LEAF LUBRICATOR CO., Ann Arbor, Mich.

T.A.

COUPON

SPRING LEAF LUBRICATOR CO.,
Ann Arbor, Mich.

Gentlemen: I am interested in Knowlson's Spring Leaf Spreader. Kindly send me details of your proposition to dealers.

Name.....

Address.....

ALL THAT YOU DESIRE OR EXPECT IN A MOTOR CAR AT A PRICE THAT DEMANDS YOUR INVESTIGATION.

4 and 5 Pass. $2,850
7 Pass. 2,950

The SPEEDWELL MOTOR CAR COMPANY
DAYTON, OHIO

9 OF EVERY TEN CARS in use today -- costing $2500 and more—carry Klaxons.

57 car makers—including the makers of every high-grade car in America — regularly equip with them.

200,000 Klaxon users know the Klaxon is essential to motoring safety.

26 large cities today require the use of a signal producing an *"abrupt note, sufficiently loud to be heard under all conditions of traffic."*

At Camp Week-End

Third of the Hupmobile Outdoor series now appearing in the national advertising—and giving Hupmobile dealers a new sales lead.

A huge sales organization with one definite aim

Hupmobile

Hupmobile "32" Six passenger
$1200 f. o. b. Detroit

In Canada, $1430 f.o.b. Windsor

Four-cylinder motor, cylinders, 3¼-inch bore by 5½-inch stroke; cast en bloc. Unit power plant.

Selective type transmission, sliding gears.

Irreversible, screw and double nut steering gear.

Full-floating rear axle.

Twelve by two-inch brakes, external contracting and internal expanding.

Wheelbase, 126 inches.

Tires, 33x4 inches.

Equipment of windshield, mohair top with envelope, Jiffy curtains, speedometer, quick detachable rims, rear shock absorber, two folding and revolving seats in tonneau, tonneau foot rests, gas headlights, Prest-o-Lite tank, oil lamps, tools and horn.

Finish, black with nickel trimmings.

"32" Touring Car *In Canada, $1180.*	**$1000**
"32" Roadster *In Canada, $1180.*	**$1000**
"20" H. P. Runabout *In Canada, $850.*	**$ 750**

F.O.B. Detroit, *or Windsor,* fully equipped.

Our aim is to make every Hupmobile dealer an integral part of a huge sales organization—not let him remain merely an automobile dealer.

We believe thoroughly in co-operation.

We want the co-operation of every Hupmobile dealer, naturally.

But, what is vastly more important to the dealer himself, we want him to accept and avail himself of our co-operation in his own territory.

We want the Hupmobile dealer to be as close to the factory as those members of the sales department who are inside the factory.

He should be, in fact, a member of the Hupmobile sales organization—working along definite lines, with a very definite purpose to accomplish.

And we can materially aid and assist every Hupmobile dealer who imbues himself with this spirit, as the majority of our dealers have learned.

A car with a reputation, and the quality to maintain its good name; a widespread and continuous advertising campaign; a home journal for Hupmobile dealers and no one else; sales suggestions of real and definite value.

These are the Hupmobile dealer's privileges and prerogatives—the things that link him closely and securely to the factory.

These are advantages beyond the power of every motor car manufacturer to offer.

HUPP MOTOR CAR COMPANY, 1252 Milwaukee Ave., Detroit, Mich.

Canadian Business handled by HUPP MOTOR CAR CO., Ltd. Factory, Windsor, Ontario

Regal

Regal Facts For You—

Mr. Dealer: We have a right to your serious attention because of two things:

1st. We are building cars that challenge comparison in point of constructional superiority, efficiency, dependability and beauty.

2nd. These cars sell around $1,000—the market that answers the greatest motor car demand today.

You must sell the car that *stands up* under every conceivable road condition—that will build your reputation for selecting an efficient car—that will bring you greater business.

That is just what Regal cars, the world over, are doing for Regal dealers.

Regal Underslung Cars

These cars sell around $1,000. When you prove to a prospective customer the values consequent on the underslung construction, they sell immediately. Price is no bar.

Regal Underslungs—the frame below the axle—insure the occupants against skidding and turning turtle. With all equipment a Regal Underslung will cling to a 60° incline.

No car rides easier than a Regal Underslung. A Regal ride is a joltless, bumpless ride. The underslung construction allows us to use a very flat spring, giving a maximum of ease and comfort. These are so attached that the vibrating in each "half-spring" is different.

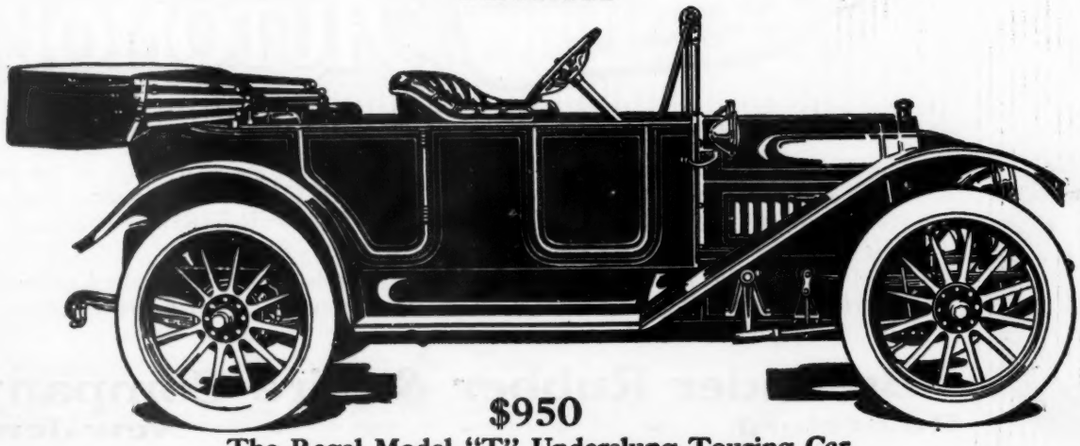
Regal cars are unusually economical. The limited upward rebound of springs relieves the wear on tires. The straight shaft drive transmits all power to the rear axle, thus cutting down gasoline consumption.

Regal cars are low and rakish in appearance. Their beauty is a strong selling factor.

Write Us Today

We've got a substantial, profitable, co-operative proposition for wide-awake dealers. It's to your interest to know it. Write or wire us today. We want to talk more Regal facts with you. *Be sure and ask for Catalog K.*

Regal Motor Car Company
DETROIT



$950

The Regal Model "T" Underslung Touring Car

Extra equipment, top, windshield and speedometer — $75

(94)

READ WHAT TWO SAY ABOUT

Before The Race

The ONLY Tires that went through the

peed.

The most remarkable tire performance of the day were the Braender tires on Mulford's Mercedes. These are single-cured wrapped tread tires, made in Rutherford, N. J. By single cure is meant that the carcass and tread portion of the tire are all vulcanized together in one process, whereas in many tires there are two curing processes. Mulford's rear tires did not have a mark on them at the end of the 500 miles. There was one short cross-cut in the right front.

rious other makes of tires were Mercer which won second plac

The AUTOMOBILE

The BRAENDER TIRES are the only tires that went the entire distance in the gruelling Decoration Day race without a change. These were STOCK TIRES—the same kind of tires that *you can* and *do* buy through any dealer selling BRAENDER TIRES.

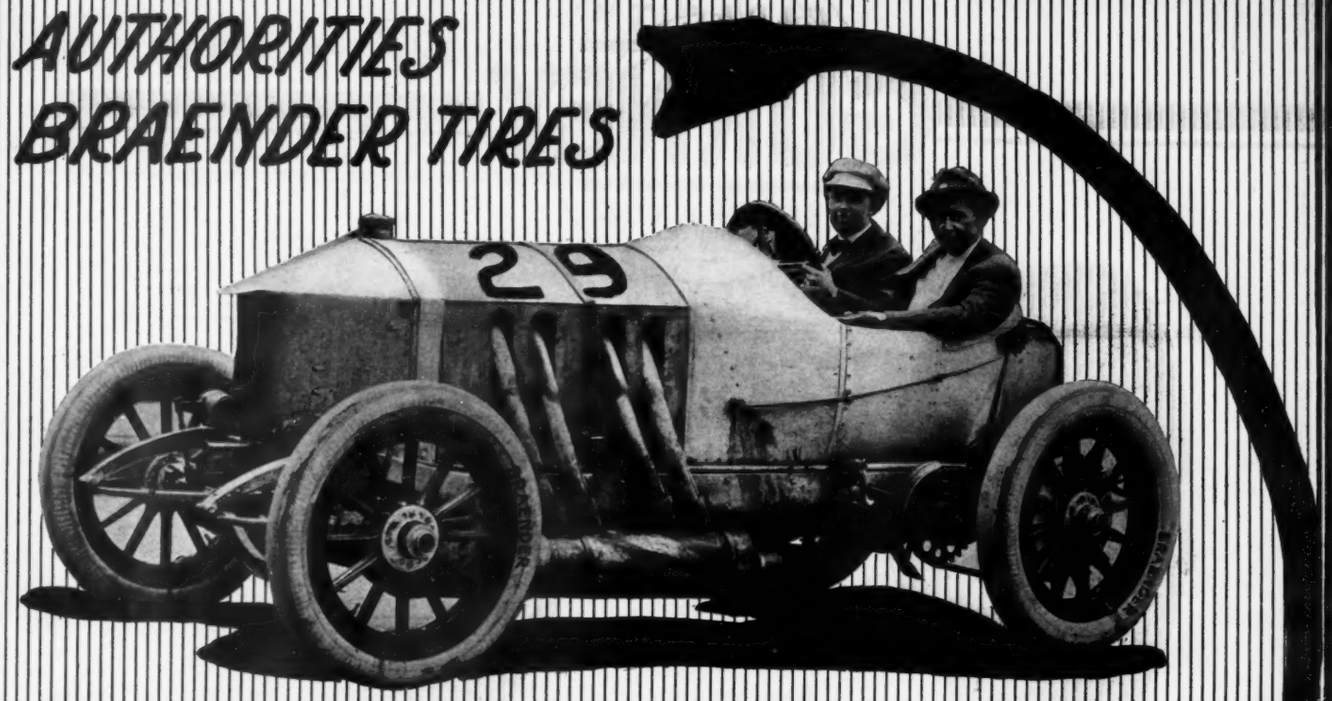
This is the most wonderful record ever made by tires of any make.

The BRAENDER TIRES after the race were capable of several hundred miles of additional service. The only sign of wear was on the right front—a cut from running over a small part dropped from another car.

Braender Rubber & Tire Company

Rutherford - - - - - New Jersey

AUTHORITIES BRAENDER TIRES



After The Race

500 mile race without a change

Ralph Mulford holds the record for tire service, running the entire 500 miles on the same set of tires, which at the end of the run seemed capable of 200 or 300 miles more. These tires were Braender tires, which made their first appearance in racing on Mulford's car last Friday.

MOTOR AGE

Tear Off—And Mail—The Coupon

Mail us the coupon and we will send you booklet describing our peculiar process of making these splendid tires, together with price list. BRAENDER TIRES WILL REDUCE TIRE EXPENSE AND ELIMINATE TIRE TROUBLE.

To Dealers:

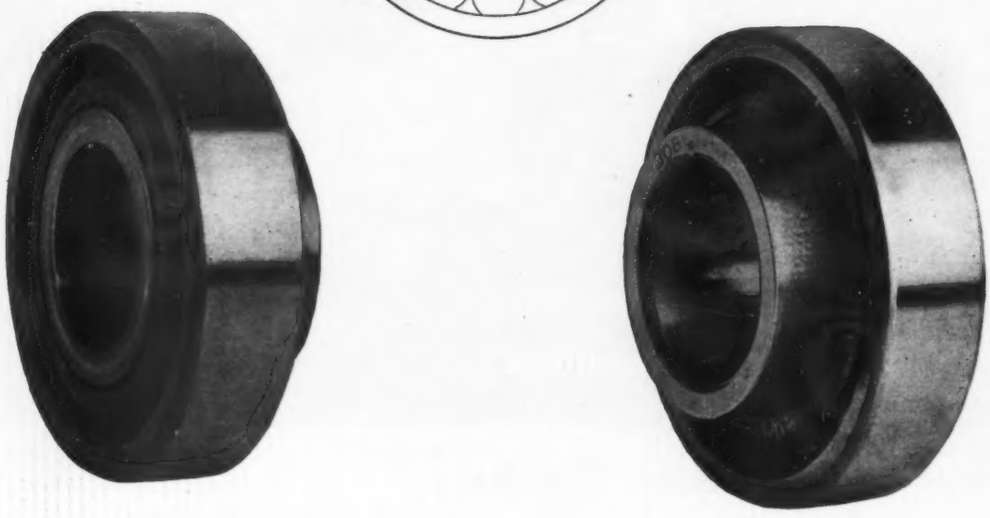
We want a live, aggressive representative in every town to handle BRAENDER TIRES. You should write us at once for particulars.

Braender Rubber & Tire Company
Rutherford, New Jersey

The Mercedes car with the original BRAENDER TIRES was exhibited for over two weeks in the Demarest window at 57th Street and Broadway, New York City

Braender Rubber & Tire Co., Rutherford, N. J.
Gentlemen: Kindly send me your booklet describing BRAENDER TIRES.
Name.....
Address.....
City..... State..... T. A.

CAPACITY
GURNEY
ENDURANCE



The Gurney Radio-Thrust Bearing

¶ It meets and fills a distinct want that has never been just met before. The Gurney Radio-Thrust Bearing carries either Radial or Thrust load or **Both.** For loads that are alternately radial and axial, or for loads that are a combination of radial and axial, it is performing the service of two bearings, a radial and a thrust and doing it to the complete satisfaction of many users. The gain is in simplified construction, reduction of friction and so increasing efficiency, and reduced cost.

¶ It is especially valuable where thrust loads have to be carried at high speeds.

¶ It is self-contained, made in the regular sizes for annular bearings either single or double row.

¶ Two bearings in the place of and at the price of one.

Gurney Ball Bearing Company

JAMESTOWN, N. Y.

The Atwater Kent Ignition System

You used to drive Your car as a "stunt"

Today you drive it for pleasure or business and the less you have to think about "stunts" the better you like the car.

There was a time when changing gears was a stunt. Keeping the sight feed oiler at its work, and the coil tremblers tuned up, and the gas generator in condition to generate were other feats of that Stone Age of motoring.

But if you had to go through all those **coups de legerdemain** today you would sell your car and use the trolley.

But there's one bit of juggling that you still practice —and it takes some skill, too! That is the manipulation of the spark lever.

There's a difference between managing the spark and managing the throttle. The latter is voluntary; you open the throttle to go faster and close it to go slower. But the former is forced upon you by the peculiarities of the engine. You advance or retard the spark because you must, not because you like to. And many drivers never really get the knack—they advance or retard at the wrong time, and fuel is wasted and bearings strained in consequence.

Hand control of the spark, for ordinary ranges of speed, is really as much a relic of the past as constant regulation of the mixture would be. Just imagine yourself juggling with the carburetor in the way you do with the spark advance! Automatic control is as sure to come in the one case as in the other—and **it is already here,** for some thousands of motorists who have read the signs of the times and provided themselves with the truly modern kind of ignition service.

We should like to tell you all about the new Atwater Kent System—Type K—not merely because we want to sell it, though naturally that is a factor, but because we know that automatic spark control is the coming thing, and that the Atwater Kent embodiment of that principle gives the ultimate in reliability, efficiency, and convenience. There's not a motorist who installs it but wonders how he ever endured the old annoyance so long. And the marvel of it all is the simplicity and low cost of the device!

In another year or two automatic control will be universally demanded. You will want to be in the forefront. Write your name and address on the margin of this page and we will send you our Booklet "B" and full particulars of the Atwater Kent System without obligation on your part.

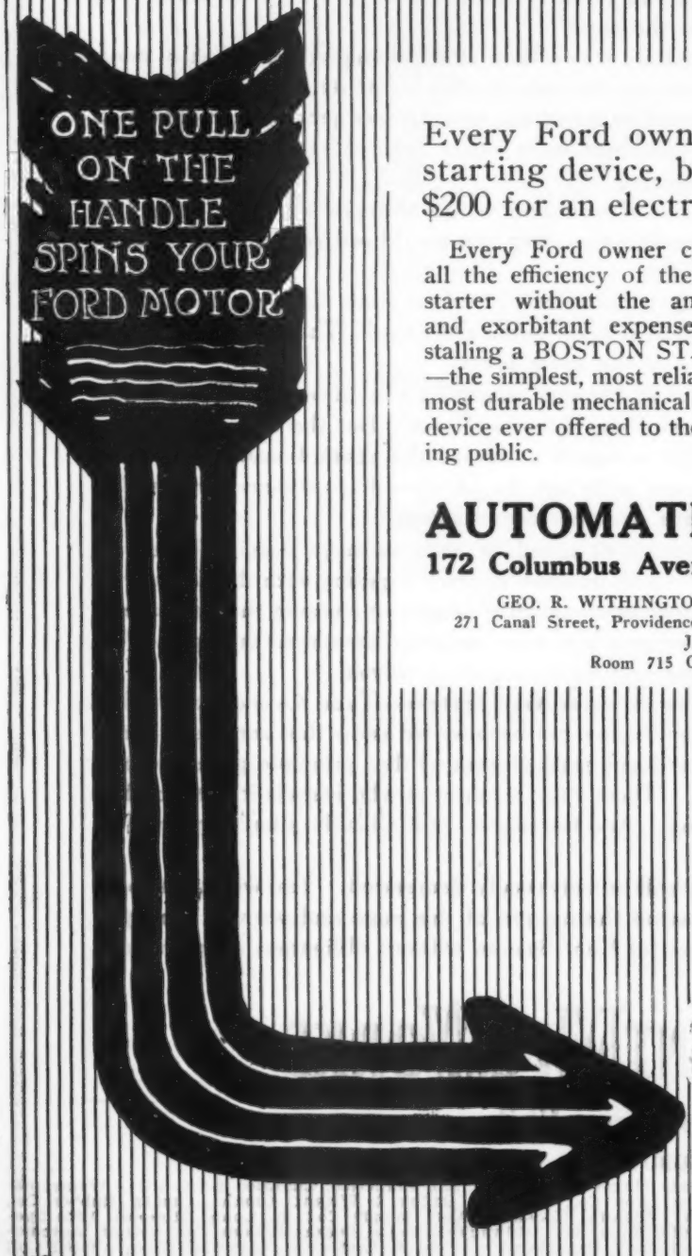
ATWATER KENT MFG. WORKS

4938 Stenton Ave., Phila., Pa.

DISTRIBUTORS:

New York, E. J. Edmond Co.; Chicago, Motor Car Supply Co., Pellets Magneto Exchange; San Francisco, Chanslor & Lyon Co., Weinstock-Nichols Co.; Los Angeles, E. A. Featherstone; Seattle, Chanslor & Lyon Co.; Portland, Ballou & Wright; Omaha, Omaha Rubber Co., Powell Auto Supply Co.; Dallas and Houston, Fisk Co. of Texas; Wichita, Hockaday Auto Supply Co.; St. Louis, Missouri Auto Specialty Co.; Salina, Lee Hardware Co.; Kansas City, Kansas City Auto Supply Co.; Milwaukee, Julius Andrae & Sons Co.; Detroit, Automobile Equipment Co.; Boston, Motor Supply Shop; Denver, Auto Equipment Co.; Hartford, Post & Lester Co.; Atlanta, Elyea-Austell Co.; Chattanooga, Southern Auto & Supply Co.

Stop cranking! Use the Boston Starter



Every Ford owner realizes the need of a self starting device, but very few are willing to pay $200 for an electric outfit to go with a $600 car.

Every Ford owner can have all the efficiency of the electric starter without the annoyance and exorbitant expense by installing a BOSTON STARTER —the simplest, most reliable, and most durable mechanical starting device ever offered to the motoring public.

No matter how long your motor has been standing or what the temperature may be, you can turn it over instantly by one pull on the handle located on the dash. You can't afford to be without this starter. Write us for prices.

We want agents everywhere.

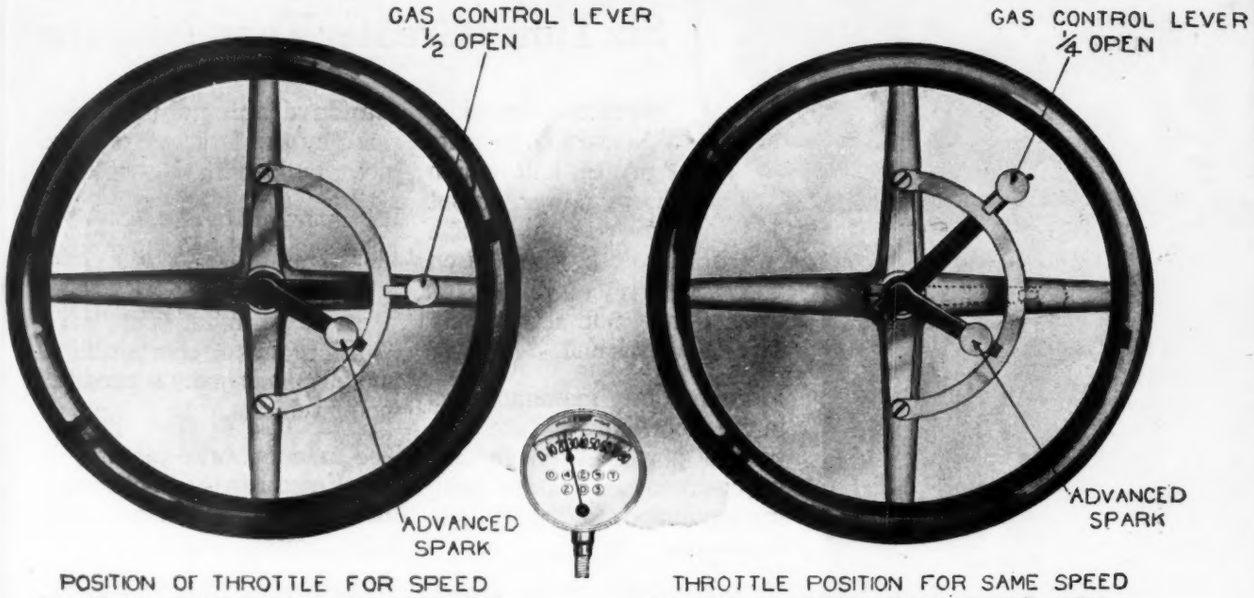
AUTOMATIC APPLIANCE CO.
172 Columbus Avenue BOSTON, MASS.

GEO. R. WITHINGTON,
271 Canal Street, Providence, R. I.

WORCESTER AUTOMOBILE CO.,
10 Warren Street, Worcester, Mass.

J. VERNER ANDERSON,
Room 715 Conn. Mutual Bldg., Hartford, Conn.

Your Bearing Equipment Does Make a Difference



POSITION OF THROTTLE FOR SPEED OF 25 MILES PER HOUR ON AVERAGE CAR, USING POWER CONSUMING BEARINGS

THROTTLE POSITION FOR SAME SPEED ON CAR EQUIPPED THROUGHOUT WITH NEW DEPARTURE BALL BEARINGS.

NEW DEPARTURE BALL BEARINGS

Save gasolene consumption by diminishing friction, and minimizing maintenance and repair costs

Every practical motorist knows that power lost in transmission from its source to the point of application reduces the efficiency of the mechanism. More fuel is needed to do a given amount of work when the frictional losses are high, and only a comparatively small part of the motor energy is available for vehicle propulsion.

Ball Bearings overcome this very condition more completely than do bearings of any other type.

New Departure Ball Bearings are superior eliminators of friction. By conserving power at the bearing points, maximum motor energy is available and the gasolene used to overcome the friction of bearings of other types is utilized for driving the car.

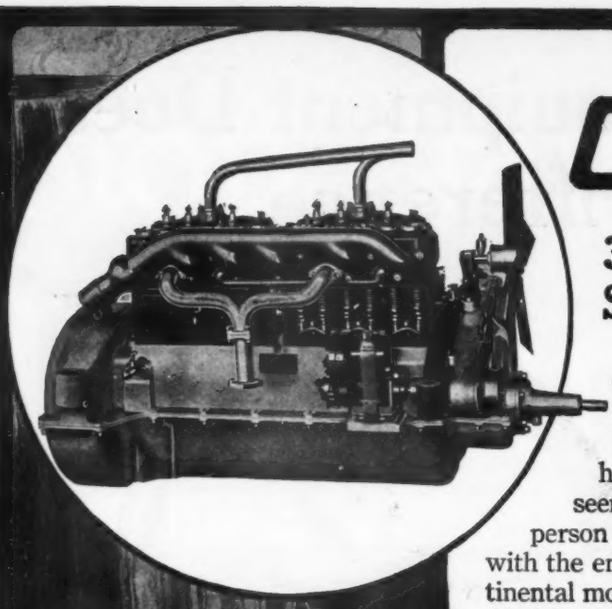
New Departure Ball Bearings are guaranteed and have proven their quality by successful installation in the majority of American-made cars.

Whether you are a manufacturer or motorist you should have our new brochure on "Bearing Friction and Its Elimination." Copy will be sent you on request.

THE NEW DEPARTURE MANUFACTURING COMPANY

BRISTOL, CONN.

WESTERN BRANCH—1016-17 Ford Building, Detroit



Continental

3,000,000 Horse Power
Six Times Greater Than Niagara

Great as we consider Niagara, huge as its present half million horse power output seems to the average person yet in comparison with the energy of 75,000 Continental motors in active, daily service—it is small.

More than fifty manufacturers in the motor industry use Continental power—keen, far-seeing business men who are building reputations for the struggle to survive.

No quick decisions, no guess-work appeal to them. Cold investigation of motor worth, exhaustive tests, careful balancing of motor reputations before the verdict is handed down of—Continental.

Why?---Because it is America's standard automobile engine made by the largest exclusive motor builders in the world.

It is approved by the motor vehicle buyer and is a big sales asset.

It is the result of ten years efforts in motor specialization and has *made* many successful motor vehicles.

The manufacturer can buy a better motor in the Continental for less money than he could build himself.

These reasons have *convinced.* And 75,000 of these famous motors in successful service furnish proof of Continental dominance in the trade.

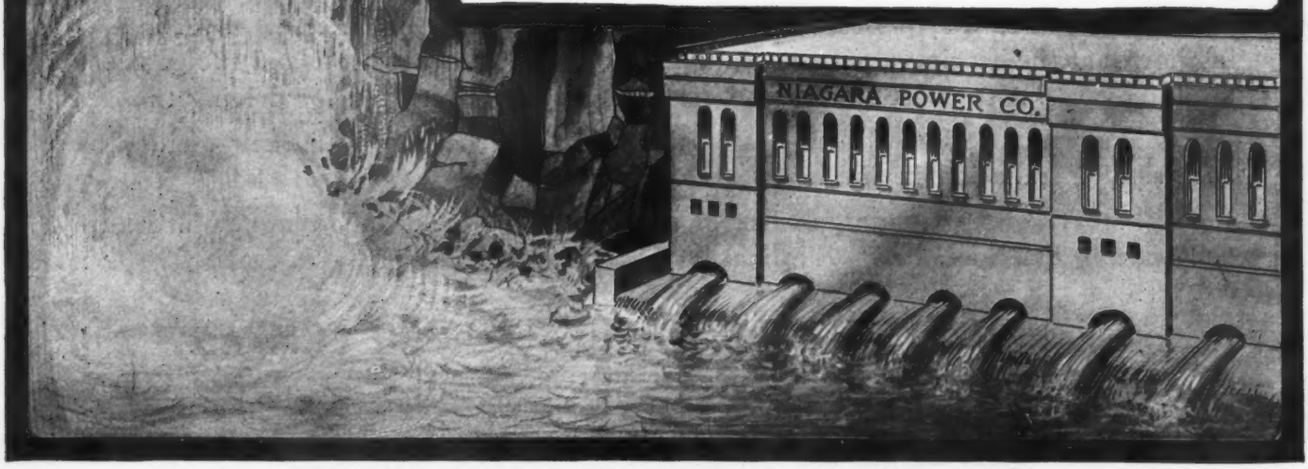
A Continental in the chassis inspires confidence—the keystone of successful business.

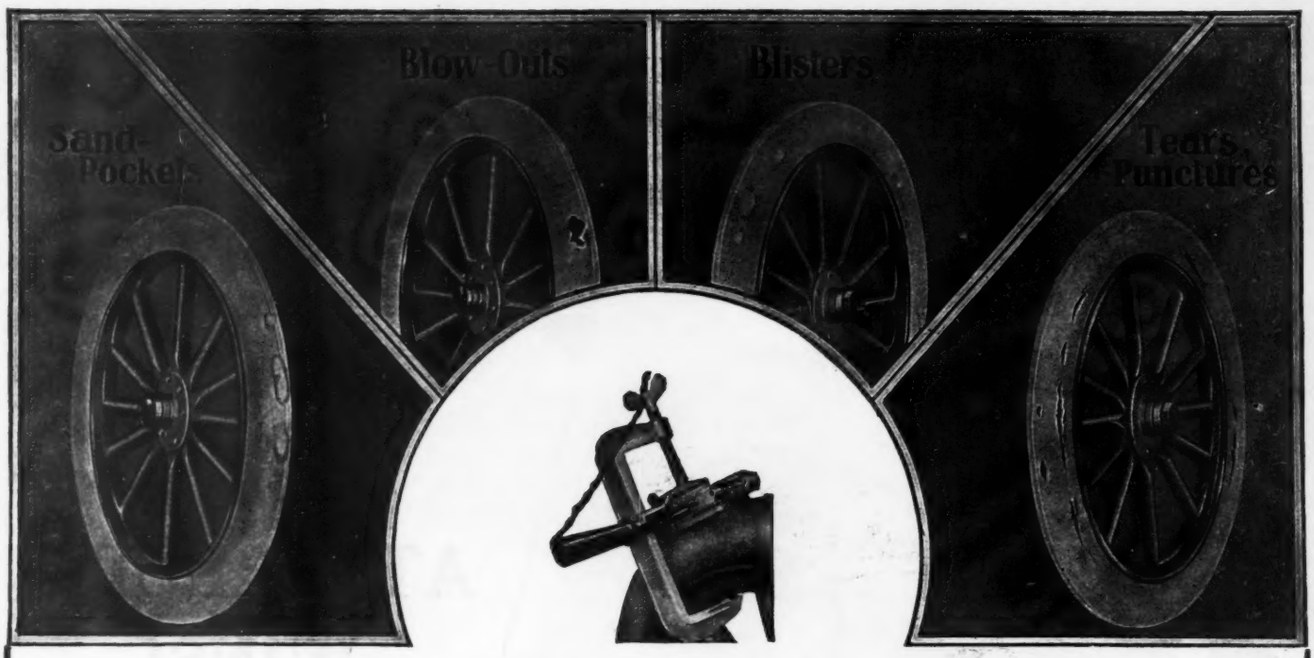
Use this confidence in the Continental for your profit and protection.

Continental Motor Mfg. Co.

Detroit, Michigan

Factories—Detroit and Muskegon, Michigan





Motorists: *End your tire troubles*

Seventy-five per cent. of tire expense comes from neglected casing cuts. Seal those cuts permanently before dirt and water get in to rot the fabric; and your tires will run until the tread rubber is WORN through. You always know that the fabric is sound—ready to give maximum service. You're relieved of the delay and inconvenience of changing tires that blow out when you're on a PLEASURE trip.

SHALER ELECTRIC VULCANIZER

with temperature controlled *Automatically*

Easy and safe for you or your chauffeur to operate. When you see a cut in your tires, fill it with raw rubber—furnished with the outfit—clamp on the vulcanizer, plug into any electric light socket and in fifteen minutes you have a repair that will outwear the tire. No watching or regulating required. The temperature of the vulcanizer is held at exactly the right degree by a thermostat that automatically turns the current off and on as required.

The Shaler mends tubes, too, as perfectly as any garage could.

You can't expect tires to take care of themselves. Help them a little and treble their mileage.

There are Shalers for every requirement—prices $2.00 to $20.00.

Get this tire book *FREE*

Care and Repair of Tires contains descriptions of the best tire-saving appliances and emergency repair kinks. Tells how the Shaler Vulcanizer will save you money and make you independent of repair shops. Will send you one copy free—post-paid—if you fill out and return the coupon. Get busy, the edition is limited.

C. A. SHALER CO., 125 4th St., Waupun, Wis.

Name.....

Address.....

C. A. SHALER CO.
125 Fourth Street
Waupun
Wis.

THE ATTERBURY LINE

Digging Atterbury No. 16, winner of Division 5-K, out of the mud outside the District of Columbia, where good roads should abound

The ATTERBURY WINS!

FOUR days of strenuous road work! Up hill and down hill, over good roads and bad roads, ATTERBURY TRUCKS proved their efficiency and economy. An ATTERBURY 2-ton truck, contesting in the 4-day motor truck demonstration conducted by the Washington Post, won in its division.

The entire trip of 288 miles was made at an upkeep cost of only 1.72 cents per ton mile.

Although competition in the motor truck field is today keener than ever, ATTERBURY TRUCKS still hold their dominant position. ATTERBURY TRUCKS have gained a sales-making reputation for quick delivery, service and economy of operation.

ATTERBURY TRUCKS combine fifteen radical improvements which are remedies for the defects common to ordinary trucks. These improvements are your guarantee of years of splendid service.

No matter what your motor truck needs are, there is an ATTERBURY TRUCK to satisfy it.

The ATTERBURY line comprises 1,500 pound, 1, 1½, 2, 3, 5 ton trucks, sight-seeing and pay-as-you-enter cars.

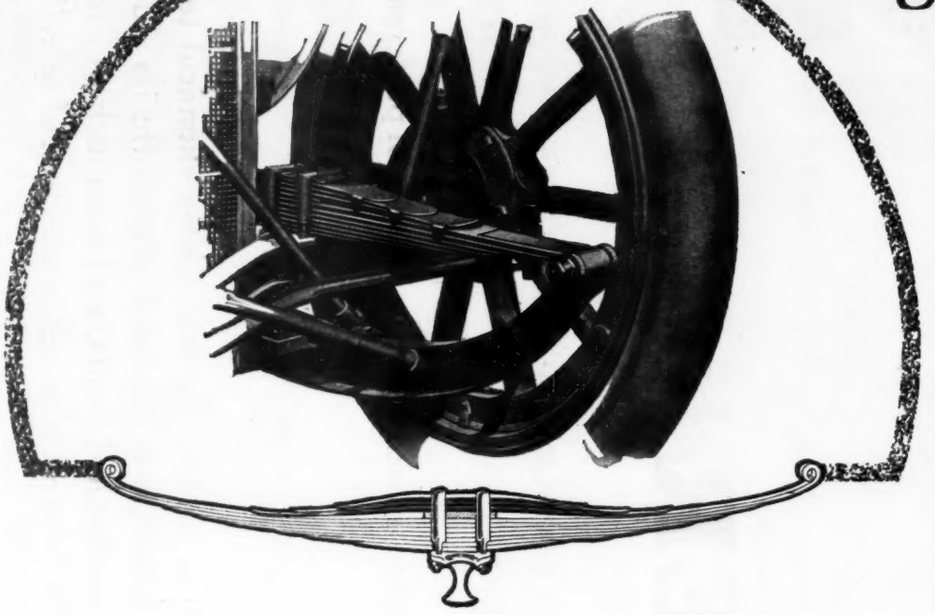
DEALERS should write for inside facts covering the sales assistance that we give. Our liberal agency offer is worth while investigating. WRITE TODAY.

ATTERBURY MOTOR CAR COMPANY

Black Rock, Dept. A. **Buffalo, New York**

Please mention The Automobile when writing to Advertisers

The AMERICAN Underslung



HAS ADOPTED THE AMES AUTOMATIC SHOCK ABSORBER AS STANDARD EQUIPMENT

First introduced to the public at the New York Show, January, 1913.

Its adoption as standard equipment by one of America's foremost cars in less than SIX MONTHS after its introduction, marks a RECORD in MOTORDOM. In sales to private owners it is making records equally remarkable.

Just Efficiency and Simplicity

Send for convincing literature and the

AMES GIRL

CLARENCE N. PEACOCK & CO.

Exclusive Licensees **1788 BROADWAY, NEW YORK CITY**

DEALERS—Territorial Selling Rights are being rapidly assigned. Immediate application is advisable.

Please mention The Automobile when writing to Advertisers

INVADER OIL

Which is the best Automobile? Which is the best tire?

There is no way of finding out except by trying them all and then exercising your individual preference or caprice.

Which is the best oil?

Neither preference nor caprice enters into this. The best oil is simply the one whose chemical tests show it to be best suited to the mechanical conditions under which it is required to perform its work. Inasmuch as every motor operates within certain inflexible mechanical limits, and inasmuch as every oil possesses certain inflexible chemical tests, the selection of the best oil is merely a question of selecting the one with the best tests. Nothing more.

There are different tests, but a very simple one is the gravity test, which shows how much carbon an oil contains.

It is a well-known scientific fact, for instance, that carbon in a motor oil is objectionable—and that the oil with the least carbon will (other things being equal) be the best.

oil with the least carbon will (other things being equal) be the best.

It is an equally well-known scientific fact that the amount of carbon in an oil is proportionate to the weight or "gravity" of the oil. The lighter the gravity the less carbon the oil will contain. *Even those who are only superficially familiar with these things know that gasoline with a light gravity contains less carbon than gasoline with a heavy gravity.*

It is not difficult to find out which of any two oils has the lightest gravity and contains the least carbon. Simply take two samples of oil in glass bottles (Invader Oil and any other) and pour the other oil into the Invader Oil. *The other oil will sink to the bottom.*

Avoid the oil which sinks to the bottom—it has the most carbon, and carbon is the thing that causes trouble.

Of the many oils being called to your attention, Invader Oil has the lightest gravity. It contains the least carbon. It is the best because its tests are better.

I-O-C GEAR OIL is the only oil ever manufactured especially and exclusively for the lubrication of Automobile Transmission Gears. Write for prices and descriptive booklet.

INVADER OIL COMPANY

(Lessees of Chas. F. Kellom & Co.)

Main Office—84 Broad St., New York. **Factories—New York and Philadelphia**

Branches: { **PHILADELPHIA,** 113 Arch St. and 719 Broad St. **BOSTON,** 284 Columbus Ave. **WASHINGTON,** 3627 New Hampshire Ave., N.W.

Territorial Agents:

Boyer-Campbell Company, Detroit, Mich.
Beck & Corbitt Iron Co., St. Louis, Mo.
American Lubricating & Supply Co., Kansas City, Mo.
Electric Mfg. Company, St. Paul, Minn.
The Lee Hardware Co., Salina, Kans.
Motor Car Supply Co., Chicago, Ill.
James Bailey Company, Portland, Maine

Please mention The Automobile when writing to Advertisers

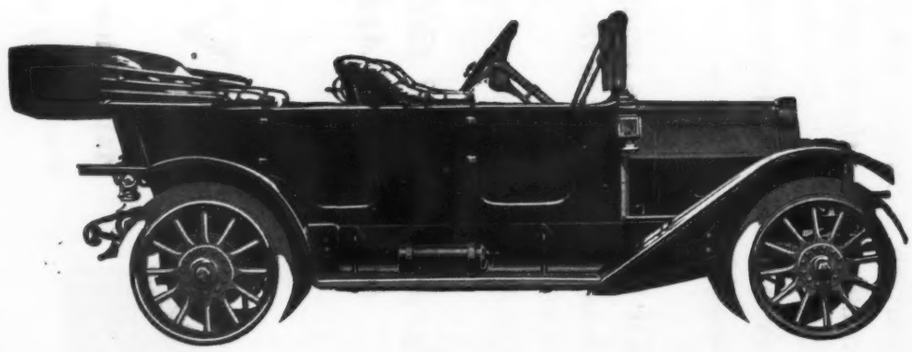
Overland

COMPLETELY comfortable, a masterpiece mechanically, the big, sturdy, thirty horsepower, five passenger Overland touring car furnishes daily motor car gossip as the greatest value for the least money.

Catalogue on request. Please address Dept. 38

The Willys-Overland Company
Toledo, Ohio

$985 Completely Equipped
F. O. B. Toledo



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If you crank by hand you make a raft out of a convenient fence.

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The Knight Motor Supreme

Official test demonstrates beyond question the superiority of the Knight type sleeve valve motor over the poppet valve type

A short time ago a 6-cylinder 38 H. P. poppet-valve motor of high-grade manufacture was given an official test by the Automobile Club of America, in New York. It was run for 300 hours. During that time it averaged 35.7 horsepower—*less than its nominal rating. At the close of the test it showed less power than at the beginning, despite the fact that valves were twice adjusted in an effort to sustain the power.* This motor was of the latest and most highly improved design —*but it was a poppet-valve motor.*

Back in 1909—four years ago—a 4-cylinder 38 H. P. Knight sleeve valve motor was given a similar—but much harder—test. It was run on the block and on the road in a test covering *320 hours.* During this test it averaged 53 horsepower—40% *more than its rating.* It was also driven 2000 miles on the famous Brooklands track, *and after all this it showed more power at the finish than at the beginning.* No adjustments were made to the mechanism of the motor at any time.

Thus every claim of the superiority of the Knight type motor has been officially and unmistakably proven *by the testimony of the poppet valve itself*, and this testimony again supports the statement of the Stearns-Knight that—

The Stearns-Knight "Four" is better than any poppet valve "Six," and that—

The only car better than the Stearns-Knight "Four" is the Stearns-Knight "Six."

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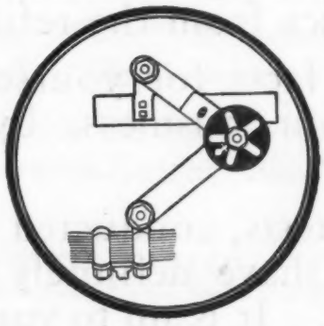
New Truffault-Hartford Automatic —The Final Word in Shock Absorbers

For years the real standard in shock absorbers has been the Truffault-Hartford. Today it is regular equipment on twenty-five leading cars.

It is hard to believe that the original could be improved upon, but its inventor, Mr. E. V. Hartford, has achieved the seemingly impossible improvement in the New Automatic Truffault-Hartford.

This new type, while still retaining the friction principle of the original Truffault-Hartford has additional merits which make it the most notable advance in shock absorber construction yet offered the automobile world.

In the New Automatic there are three degrees of frictional tension—the *first* absorbs the slight but none the less noticeable oscillation of the springs on smooth roads—the *second* exerts a positive control over the springs on moderately rough roads—the *third* only comes into play when the road assumes extreme roughness and its control is as positive and imperceptible as either the first or the second.



These tensions come into play absolutely automatically as the condition calling for their use arises. There is no rattle —no "noise" no evidence in fact that a change of tension is taking place.

For both stiff and highly flexible springs, the New Automatic is equally efficient. It permits the use of the extremely flexible spring with safety and by its second and third tensional degrees keeps the heaviest, most powerful spring in control.

All that the original

Truffault-Hartford SHOCK ABSORBER
"The Pioneer Shock Absorber"

has realized in comfort, safety and economy is realized to even fuller extent in the New Automatic. Fits any car and does not mar its appearance. $60 per set of four. Other Truffault-Hartfords—$50—$40—$25—$15 per set of four. Write for New Catalog giving full description.

Catalog on Request

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TABLE of CONTENTS

VOL. XXVIII NEW YORK, JUNE 26, 1913. No. 26

Akron 1287
Alter Tariff Rate Bill 1292
Bids Opened for P. O. Cars 1293
Stanolind Saves Money 1294
Illinois for Good Roads 1295
Franklin Breaks Fuel Economy Record 1296
Zuccarelli Killed in Practice Run 1297
Editorial: Gasoline Price Is Not to Rise 1298
Quality Is Wanted in Ties.
American vs. European Salesmen Abroad 1299
The Engineering Digest 1300
The Engineers' Forum—Part II 1303
Keeping Track of Tires 1304
General Inspection 1306
Wheels for Commercial Vehicles 1309
The Rostrum 1312
Has Hard Time Starting Car
Believes Valve Stems Worn
Oil Leaks Past Piston Rings
Speed Varies with Sprocket Ratio
Why Is Four More Economical?
Ether as a Carbon Remover
Constant Inflation Means Long Tire Life 1316
Overloading Ruins Solid Truck Tires 1317
Welfare Work Raises Goodyear Efficiency 1318
New Grant Car a Real Miniature Automobile 1320
Gearless Differential Latest on the Market 1322
Cycle-Truck the Newest in the Commercial Field 1323
Vulcanizers Reduce Tire Expense 1324
Special Treads Prevent Cut Shoes 1325
Factory Miscellany 1326
The Automobile Calendar 1327
The Week in the Industry 1328
Recent Incorporations in the Automobile Field 1330
New Agencies Established During the Week 1330
Tire Tools That Facilitate Repairs 1331
Accessories for the Automobilist 1332

Index to Advertisers.....46-47

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CAUTION

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Consider what's happening right now among the makers of

AUTOMOBILES

IS the maker solid? You need to know that, **now,** before you buy a car. For the day of reckoning in the automobile industry is here. Witness the sudden changes in plans, methods, models, and prices—heavy stock offerings — reorganizations — big loans — failures, more than 25 in the past year. Excessive overheads and super-expanded plants, extravagances, and mushroom methods are coming home to roost. Already several well-known makers have failed, and cars of good reputation have disappeared from the market.

Review of Reviews says automobile stocks are not a good investment. Neither is an automobile unless its maker is sure to continue in business, making good on his guarantee, giving service to car owners, and sustaining the commercial value and public standing of his car.

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Find out where the maker stands before you buy. Know that the Winton Company has always followed sound and enduring policies. No water in its stock, no bonds, notes, or mortgages to be charged for in its price, no frantic and frequent changes in models that prematurely age and depreciate prior models, no juggling with quality, no marketing of experiments, no grasping after quantity, no exaggerated price.

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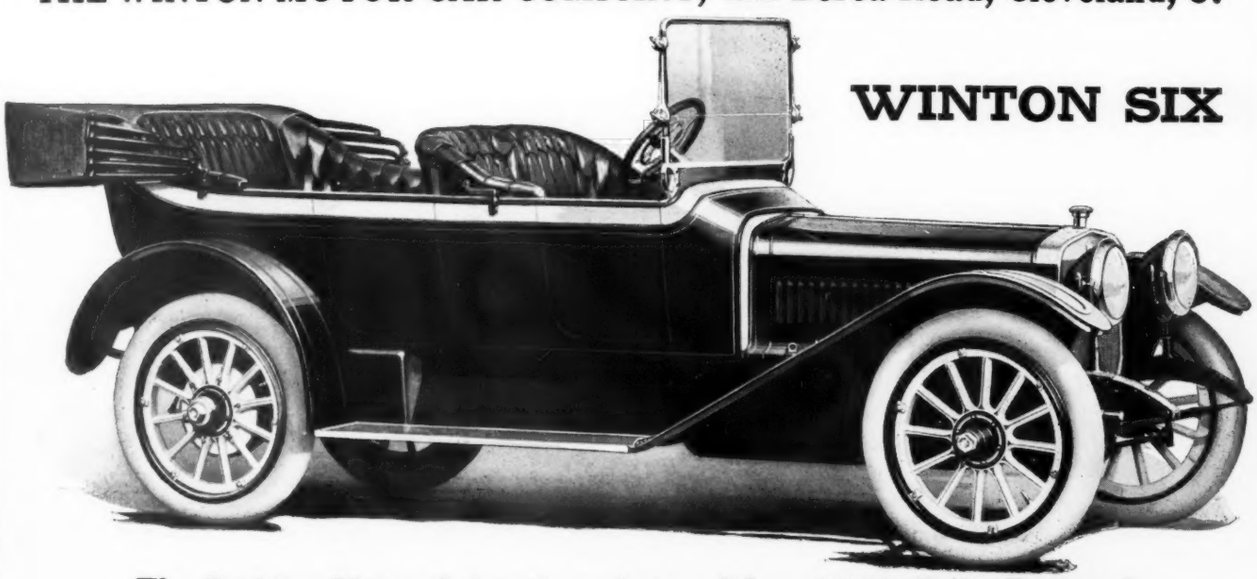
WINTON SIX



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